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# Prevalence of intestinal parasitic infections among patients attending Bugando Medical Centre in Mwanza, north-western Tanzania: a retrospective study

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**Abstract:** Gastrointestinal helminths and protozoan parasites may cause mild, acute and chronic human infections. There is inadequate reliable information on the epidemiology of these parasites among patients attending tertiary hospitals in Tanzania. This retrospective study was conducted using hospital data obtained from the Department of Medical Parasitology of Bugando Medical Centre (BMC) in Mwanza, Tanzania. A total of 3152 stool samples were recorded from January 2008-March 2010. Intestinal parasitic infections were recovered in 57.1% (1799/3152) of the stool samples. Helminths eggs were observed in 36.6% (1,153/3,152) of the samples with hookworm eggs recovered in 25.2% (793/3125) and *S. mansoni* in 5.6% (177/3125) of the samples. Protozoan parasites were recovered in 20.5% (646/3152) of the samples in which 13.6% 428/3152) had *Entamoeba histolytica/ E. dispar* and 6.9% (218/3152) *Giardia lamblia*. Prevalence of intestinal helminth infections was higher in females, 55.7% (95%CI, 51.7-59.7, n= 642) than males (n=511, 44.3%, 95%CI, 40.3-48.6). Similarly, the prevalence of protozoan infections was significantly higher among females (58.1%, 95%CI, 53.1-63.1) than males (42.3%, 95%CI, 36.5-48.2). The prevalence of helminth infections was highest among 45+ years olds and lowest in the 0-4 years olds while that of protozoan infections was highest in the 5-14 years age group (30.9%, 95%CI, 27.9-33.8) and lowest in the 0-4 years age group. In conclusion, this study shows that intestinal helminth and protozoan infections are among the common parasitic infections among patients presenting at BMC. This information may provide invaluable statistics needed for planning meaningful public control programmes that aim at reducing the prevalence and morbidity of parasitic infections.

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**Keywords:** helminth, protozoa, parasitic infections, prevalence, hospital, Tanzania

## Introduction

Intestinal helminths and protozoan parasites are major public health problems in developing countries (Lwambo *et al.*, 1999; Handzel *et al.*, 2003; Bethony *et al.*, 2002). These infections have common characteristics - they are highly endemic in populations with low socio-economic status and poor hygiene, favouring larval skin penetration and oral-faecal transmission (Ravdin, 1995; Hotez *et al.*, 2004; Sayyari *et al.*, 2005, Bethony *et*

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*al.*, 2006). The parasites are important causal agents of gastrointestinal disorders such as diarrhoea, dysentery, vomiting, lack of appetite, haematuria, abdominal distension and sometimes mentally related disorders (Garcia, 2004; Bethony *et al.*, 2006). Moreover, heavy chronic infections with *Ascaris lumbricoides* and hookworms (*Ancylostoma doudenale* or *Necator americanus*) may cause malnutrition and anaemia in high risk groups (Albanico *et al.*, 1998; Awasti *et al.*, 2003; Hotez *et al.*, 2004). Chronic infections with *Schistosoma* species (*S. haematobium* and *S. mansoni* in Tanzania) have been associated with hepatomegaly, splenomegaly, periportal fibrosis, hypertension, urinary bladder obstructions, cancer and tumour of the prostate glands (Boros, 1989; Guyatt *et al.*, 1999; Haidar, 2001; Malenganisho *et al.*, 2008; Mazigo *et al.*, 2010a).

In northwest Tanzania, there is inadequate information on the magnitude of parasitic infection among cases attended at tertiary hospitals. It has been described that information generated from in-patients departments of hospitals may provide the initial information needed for planning meaningful public control programmes (Obiamiwe, 1972). In addition, differentiation of parasitic agents is an important step for initiation of tailored treatment and prevention strategies. Therefore, the present retrospective study was conducted to determine the species and prevalence of human intestinal parasites among in-patients at Bugando Medical Centre in Mwanza, Tanzania.

## **Materials and Methods**

### ***Study area***

The study was conducted at Bugando Medical Centre in Mwanza, north-western Tanzania. This referral hospital is situated along the southern shores of Lake Victoria and has a 900 bed-capacity. BMC is located between latitudes 2°15'-2°45'S and longitudes 32°45'- 45° 38' E and lies at an altitude of 1140m. The hospital serves as a referral centre for tertiary specialist care for a catchment population of approximately 13 million people from Mwanza, Mara, Kagera, Shinyanga, Tabora and Kigoma regions of Tanzania (<http://www.bugandomedicalcentre.go.tz>).

### ***Data collection and analysis***

The study examined sample records of laboratory results contained in a designed computer database. The data covered the period of 27 months from January 2008 to March 2010. The routine stool examination method was a direct smear and 10% formol-ether concentration technique (WHO, 1991). All stool sample records were examined and positive results for helminths eggs, larvae and protozoan cyst or trophozoite infections were recorded.

Variations in distribution patterns of positive stool samples between sex and age were determined. The prevalence of infections was reported in proportions. Chi-square test ( $\chi^2$ ) was used to compare relative frequencies between groups (sex and age). Data analysis was conducted using SPSS version 11.5 (SPSS Inc, Chicago, Illinois).

### ***Ethical considerations***

Ethical clearance to conduct this study was obtained from the Bugando Medical Centre Ethical Committee (Ref: AB.286/317/01/41).

## Results

A total of 3152 stool samples (1887 in 2008, 963 in 2009 and 302 in 2010) were submitted to the Department of Medical Parasitology of BMC and included in the analysis. Of these, 1153 (36.6%; 95%CI, 33.9-39.4) were positive for intestinal helminths and 646 (20.5%, 95%CI, 17.4-23.6) for intestinal protozoa. Hookworm accounted for the most prevalent parasitic infection (25.2% (95%CI, 22.2-28.2; n=793) followed by *Schistosoma mansoni*, 5.6% (95%CI, 2.2-9; n=177) (Table 1). *Entamoeba histolytica/E. dispar* (13.6%, 95%CI, 6.6-20.8) and *Giardia lamblia* (6.9%, 95%CI,-0.001-14.3) were the only intestinal protozoan observed in the study (Table 1).

**Table 1: Prevalence (%) of helminth and protozoan infections, March 2008-Jan 2010**

Parasite	2008	2009	2010	Overall prevalence	P-value
<b>Helminth infections</b>					
Hookworms	274 (14.5%)	414 (42.9%)	105 (34.8%)	793 (25.2%)	<0.004
<i>A. lumbricoides</i>	50 (2.6%)	0.00	0.00	50 (1.6%)	< 0.05
<i>E. vermicularis</i>	9 (0.5%)	10 (1.0%)	2 (0.7%)	21(0.67%)	<0.06
<i>T. trichiura</i>	8 (0.4%)	13 (1.4%)	4 (1.3%)	25 (0.79%)	<0.07
<i>S. mansoni</i>	46 (2.4%)	103(10.7%)	28 (9.3%)	177 (5.6%)	<0.003
<i>Taenia</i> species	4 (0.2%)	13 (1.3%)	1 (0.3%)	18 (0.57%)	<0.06
<b>Protozoan infections</b>					
<i>E. histolytica/E. dispar</i>	31 (1.6%)	271 (28.1%)	126 (41.7%)	428 (13.6%)	<0.001
<i>Giardia lamblia</i>	43 (2.3%)	139 (14.4%)	36 (11.9%)	218 (6.9%)	<0.003
<b>Total sample</b>	1887	963	302	3152	

Prevalence of intestinal helminth infections was higher in females, 55.7% (95CI%, 51.7-59.7, n= 642) than males (n=511, 44.32%, 95%CI, 40.3-48.6) ( $P<0.002$ ) (Table 2). The prevalence of protozoan infections was 20.5% (95%CI, 17.5-23.6, n=646) and it was significantly higher among females (58.1%, 95%CI, 53.1-63.1) than males (42.3%, 95%CI, 36.5-48.2) (Table 2) ( $P<0.005$ ).

**Table 2: Prevalence (%) of helminth and protozoan infections stratified by sex**

Parasite	Males	Females	Overall prevalence	P-value
Hookworm	359 (24.9%)	434 (25.4%)	793 (25.2%)	<0.005
<i>A. lumbricoides</i>	27 (1.9%)	23 (1.3%)	50 (1.6%)	<0.007
<i>E. vermicularis</i>	12 (0.8%)	9 (0.5%)	21 (0.7%)	<0.06
<i>T. trichiura</i>	12 (0.8%)	13 (0.8%)	25 (0.8%)	<0.06
<i>S. mansoni</i>	93 (6.5%)	84 (4.9%)	177 (5.6%)	<0.05
<i>Taenia</i> species	8 (0.6%)	10 (0.6%)	18 (0.6%)	<0.06
<i>E. histolytica/E. dispar</i>	174 (12%)	254 (14.9%)	428 (13.5%)	<0.002
<i>G. lamblia/G. intestinalis</i>	99 (6.9%)	110 (6.4%)	209 (6.6%)	<0.003

Total samples	1441	1711	3152
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Age group specific prevalence of helminthes was highest among 45+ years olds and lowest in the 0-4 years olds (Table 3). Age-specific prevalence for protozoan infections were highest in the 5-14 years age group (30.9%, 95%CI, 27.9-33.8) and lowest in the 0-4 years age group (Table 3).

**Table 3: Prevalence (in %) of helminth and protozoan infections stratified by age**

Type infection	Age groups (Years)			
	0 -4	5 -14	15 – 44	45+
<b>Helminth</b>				
Hookworm	10.4 (36)	21.1 (71)	26.6 (509)	32.0 (177)
<i>A. lumbricoides</i>	1.5 (5)	2.1 (7)	1.7 (32)	1.1 (6)
<i>E. vermicularis</i>	0 (0)	0.6 (2)	0.7 (13)	1.1 (6)
<i>T. trichiura</i>	0.6 (2)	1.8 (6)	0.7 (13)	0.5 (3)
<i>S. mansoni</i>	2.0 (7)	5.0 (17)	6.5 (125)	5.1 (28)
<i>Taenia</i> species	0.3(1)	0.6 (2)	0.5 (10)	0.4 (2)
Age group prevalence	14.8 (51)	31.2 (105)	36.7 (702)	40.1 (222)
<b>Protozoa</b>				
<i>E. histolytica/ E. dispar</i>	7.5 (26)	16.3 (55)	14.2 (272)	15.4 (85)
<i>Giardia lamblia</i>	8.1 (28)	14.5 (49)	4.7 (90)	6.2 (34)
Age group prevalence	15.7 (54)	30.9 (104)	18.9 (362)	21.5 (119)
Total samples	345	337	1,914	553

## Discussion

In general, the prevalence of intestinal helminthes and protozoan parasites detected in the present study was similar to a previous study in Nigeria (Ozumba & Ozumba, 2002). The prevalence of intestinal helminth observed in this study, confirm that intestinal helminthiasis, mainly hookworm infection, are prevalent among patients attending Bugando Medical Centre, and mostly likely in its catchment area. Previous epidemiological surveys within the Lake Victoria basin have also reported a high prevalence of hookworm infections than other geohelminths (Lwambo *et al.*, 1999; Mazigo *et al.*, 2010b). The higher prevalence of hookworm infections has previously been reported in other rural tropical areas of low socio-economic status (Hotez, 2003; Standley *et al.*, 2010). Similarly, the high prevalence observed in our study likely to be associated with poor hygienic conditions and low socio-economic status of the population in the Lake Victoria basin.

On the other hand, the prevalence of other helminths, *A. lumbricoides*, *E. vermicularis* and *Trichuris trichiura* were very low. Indeed, earlier studies in the nearby Magu district, reported a prevalence of <1% of *A. lumbricoides*, *Trichuris trichiura* and *E. vermicularis* (Lwambo *et al.*, 1999) while one of our previous studies in the nearby Sengerema district did not detect any *A. lumbricoides*, *T. trichiura* or *E. vermicularis* (Mazigo *et al.*, 2010b). The low prevalence of these parasites is likely to be influenced by the ecological factors within the Lake Victoria basin. Contrary to findings from field

epidemiological studies, this study observed a low prevalence of *S. mansoni* (5.6%). Prevalence between 64% and 68% have recently been reported (Standley *et al.*, 2010; Mazigo *et al.* 2010b). The prevalence of *E. histolytica/ E. dispar* and *G. lamblia* reported in the present study was similar to that reported from Cameroon (Mbuh *et al.*, 2010). The high prevalence of *E. histolytica/ E. dispar* could be due to the existence of resistant cysts of the parasite in the study area as reported by Mbuh *et al.* (2010) in a recent study Cameroon.

When the prevalence of intestinal helminthiasis was analysed by sex, the females had a higher frequency of hookworm infections whereas the males had higher frequency of infections by *S. mansoni*, *E. vermicularis* and *T. trichiura*. Such sex predominance in infections rates is likely to be a reflection of different behaviour between the two groups (Albanico *et al.*, 1997; Hotez *et al.*, 2006). In a recent study in Cameroon, it was found that the higher prevalence of human intestinal protozoans in females was attributed to the fact that women usually eat unwashed fruits and vegetables or unboiled salads which may be contaminated with protozoan cysts (Mbuh *et al.*, 2010).

The trend of increasing prevalence of helminths with age observed in this study has been previously reported by other workers in the region (Lwambo *et al.*, 1999; Mazigo *et al.*, 2010b). However, it was different from the normal U-shaped curve reported from a study by Kurup *et al.* (2010). Our findings suggest that every individual in the region is at high risk of helminth infection. The age relationship in the prevalence of *E. histolytica/ E. dispar* and *G. lamblia* has been reported in various regions of Cameroon (Rossignol *et al.*, 2001; Mbuh *et al.*, 2010).

In conclusion, this study shows that intestinal helminthiasis and protozoan infections are among the common parasitic infections observed among patients presenting at BMC. This, and similar information, generated from hospitals may provide invaluable statistics needed for planning meaningful public control programmes that aim at reducing the prevalence and morbidity of parasitic infections.

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