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Short Communication

Comparative prevalence of intestinal parasitic infections (ipis) in stool samples of patients attending UMTH Maiduguri between 2006 and 2007; its community health burden and proactive counter measures implications.

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ABSTRACT: Intestinal Parasitic Infections (IPIs) is an important health issue in sub-saharan Africa. It has been associated with causing mortality, morbidity, stunting of growth, body weakness and low educational achievement among school children and even in adults, while also causing various harmful pathologies at advanced states of infections. Addressing of un-equitably spread of developmental projects related to poor access to portable drinking water and clean food, and environmental sanitation (state of personal hygiene) are related public health features of IPIs.

A study was conducted to determine and comparatively compare the prevalence of intestinal parasitic infections (IPIs) among patients who were presumptively diagnosed for suspected helminthic infections and referred to the microbiology laboratory of UMTH Maiduguri for follow-up diagnostic tests between January 2006 and December 2007. Data was retrieved from the Laboratory and analyzed. Two methods were engaged in the laboratory to screen the stool samples from the patients. Firstly, a direct smear and stain method was engaged using normal saline with Lugol's Iodine solution. This was followed by a second method involving the Formol-ether concentration stool screening technique. Results from both methods were matched to reduce errors of missing out positive IPI results. Laboratory based screening of stool samples was done for egg, worms or worm segments of IPIs; and the trophozoites or cysts (for Protozoan parasites) of the parasites. A total of 818 stool samples were examined in the laboratory and the data retrieved for analysis. Prevalence rate was highest for *E. histotytica* (protozoan parasite responsible for amoabiasis) at 10.76%, [with 8.44% prevalence rate difference from the closest IPI's prevalence which was *Taenia sp*], followed by *Taenia* sp (cause of Taeniasis) at 2.32%; next was *Strongyloides sp* (1.59%) and Hookworm (1.47%)– all helminthic parasites. This was followed by *Giardia* (1.22%), Schistosoma (1.22%), *Hymenolepsis nana* (0.61%) and *Iodamoeba sp* (0.24%). All the other IPIs that were observed had a prevalence rate of 0.12% (1/818). The protozoan parasite with the highest prevalence value was *Entamoeba hystolytica* (10.76%). This indicates that the study population should pay the most attention to steps to curtail and prevent infection by *E. histolytica* parasitic infection. The helminthic parasites *Taenia*, *Strongyloides* and Hookworm had higher prevalence rates than the other helminthic parasites observed in the study population. The other two protozoans of *Iodamoeba* and *Cryptosporidium* recorded very low levels compared to *E. histolytica* and *Giardia*. Apparently, they (*Iodamoeba* and *Cryptosporidium*) posed least public community health importance and burden in the study population.

KEYWORDS: Intestinal, parasitic, stool, prevalence, community.

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INTRODUCTION

Intestinal parasitic infections (IPIs) are among the major public health problems in Sub-saharan Africa. The distribution is mainly associated with poor personal hygiene, environmental sanitation and limited access to clean water (Gelaw et al, 2013). IPI cause major public health problems in developing countries (Sinniah et al, 2014).

Soil transmitted helminthes (STHs) together with parasitic intestinal protozoa are causes for vast amount of morbidity, discomfort and often mortality in tropical and sub-tropical regions around the world. People of all ages are affected by this cycle of prevalent parasitic infections; however, children are the most affected (Tellez et al, 1997; Khanal et al, 2011).

Intestinal parasites which have direct life cycle are transmitted by faecal oral route to human through poor personal hygiene- such as Hookworms, *Ascaris*, and *Toxocara* (in Dogs and Cats). They cause mortality and morbidity, stunting linear growth, physical weakness and low education achievement in school children (Awogun, 1984; Mehraj et al, 2008). These adverse effects are related to events involving depletion of nutrients in these children, destruction of tissues and organs, abdominal obstruction, anemia and ulcers among others, which can in cumulative effect lead to slow cognitive development and impaired learning (Nokes et al, 1992; Brooks et al, 2004; Abossie et al, 2014).

Some of the major or common IPIs include pathogens of the helminthic group (*Taenia* sp, *Strongyloides sp*,Hookworm, Schistosoma, *Trichuris, and Dicrocoelium dendriticum*) and those of the Protozoa group (*E. histotytica, Giardia, Iodamoeba sp, Cryptosporidium, Hymenolepsis nana*).

School children aged 5-15years suffer the highest infection rate and worm burden that attributes to poor sanitation and hygiene (Luong, 2003). Martins et al (2015) reported that the prevalence of intestinal parasitic diseases has remained high and constant over the past decade or more, while Rayan et al (2010) pointed out that environmental factors affect the dissemination and distribution of intestinal parasites in human communities.

The prevalence of IPIs is higher in some regions of the world and among certain types of communities. For instance, in a study to determine the Prevalence of IPIs and associated risk factors among students of Kigali institute of education in Rwanda, more than 50.5% of the stools were found to be infected with an intestinal parasite (IP) - *E. histolytica* was the highest with 54.5%, *Trichomonas intestinalis and Ascaris lumbricoides* were 20.0%, *Giardia* 3.6% and *A.duodenale* 1.8% (Niyizurugero et al, 2013).

Abaver et al (2011) reported that few studies have addressed the issue of parasitic infections in Nigeria (moreso IPIs) and these studies are concentrated in the southern regions of Nigeria. In this study in North-central Nigeria, IPIs among HIV/AIDS negative individuals was 17.6% while the overall prevalence rate in this study was 22.7% (27/119).

Factors such as illiteracy, poor hygiene, lack of access to portable drinking water and hot tropical climate in some cases, have been associated with IPIs (Mehraj et al, 2008; Abavie et al, 2011; WHO).

Importance of this study

About 400million school-age children are infected with roundworm, whipworm and hookworm worldwide (WHO, 1987; Gamboa et al 1998; Abossie and Seid, 2014).

It is a significant issue in sub-saharan Africa. In places like Rwanda Kigali, eradication IPIs programmes towards preschool aged and school aged children are undertaken while there are gaps relation to such programmes for students in tertiary institutions (and older ones) (Niyizurugero et al, 2013).

They have been associated with causing mortality and morbidity, stunting linear growth, physical weakness and low education achievement in school children, and other problems that can lead to slow cognitive development and impaired learning – associated with nutrients in these children, destroy tissues and organs, cause abdominal obstruction, anemia, ulcers related pathologies (Gamboa et al, 1998; Nokes and Bundy 1992).

In respect to particular IPIs, for instance, Cysticercosis imposes substantial global burden on human beings related to epilepsy, ocular disorders, other neurological manifestations, and economic losses related to disability and lost productivity. In Tanzania, an East African country, *T. solium* is considered widespread in the northern, central, and southern regions based on porcine cysticercosis surveys (Engels et al, 2003; Mwanjali et al, 2013).

Thus, this study should be of public and community health importance to this study area and places of similar climate and biogeography in Africa and the tropics, by contributing to data needed for effective planning in preventive and control measures to curtail any possibility of spread of IPIs particularly in this study area.

METHODS

Study area and study population

The assessment of the prevalence of intestinal parasitic infections among patient attending University of Maiduguri Teaching Hospital (UMTH) Maiduguri, Borno State was carried out based on data retrieved from the Parasitology Laboratory of University of Maiduguri Teaching Hospital is the capital of Borno State. Maiduguri it is located at the North Eastern part of

Nigeria with an area of 69,453 sq.km. The state lies between latitude 10^0N and 13^0N and longitude 12^0 E and 15^0 E.

A retrospective study of patients attending the hospital was undertaken from laboratory kept records for the period between January 2006 and December 2007. Specimens (stools) were collected from the patients with suspected cases of Helminthic infection (including Taeniasis), after seeing the medical doctor at the hospital and referred by the later for laboratory diagnosis.

METHOD

The following methods were used for the analysis of the stool samples for egg, worms or worm segments of the parasites.

LABORATORY EXAMINATION OF STOOL SAMPLES FOR INTESTINAL PARASITIC INFECTIONS (IPIs)

Two methods were engaged in the laboratory to screen the stool samples from the patients. Firstly, a direct smear and stain method was engaged using normal saline with Lugol's Iodine solution. This was followed by a second method involving the Formol-ether concentration stool screening technique. Both results were matched and combined, to reduce and correct for errors of missing out IPIs in samples were they were present.

Laboratory based screening of stool samples was done for egg, worms or worm segments (for helminthic parasites); and the trophozoites or cysts (for Protozoan parasites) of the parasites.

A total of 818 stool samples were examined between January 2006 and December 2007 in the laboratory and the data retrieved for analyses.

Data analysis

Data retrieved was entered into Microsoft Excel package and analyzed for mean, percentages, maxima and minima values. Also, graphical analysis was performed to examine for other features of the analyzed data– such as maxima and minima prevalence values.

RESULTS

Table 1: Prevalence of human intestinal parasites observed among patients examined at UMTH Maiduguri in 2006 and 2007.

Intestinal Parasite	Counts, and Prevalence rate (%)
Giardia	10, 1.22%
Strongyloides	13, 1.59%
E. histolytica*	88, 10.76%
Hookworm	12, 1.47%
Hymenolepsis nana	5, 0.61%
Trichuris spp#	1, 0.12%
Iodamoeba sp	2, 0.24%
Schistosoma	10, 1.22%
Taenia spp	19, 2.32%
Ascaris lumbricoides	7, 0.86%
Cryptosporidium spp#	1, 0.12%
Dicrocoelium dendriticum#	1, 0.12%
Total count	169, 20.7%

*Recorded Maxima in Prevalence rate
#Recorded Minima in Prevalence rate

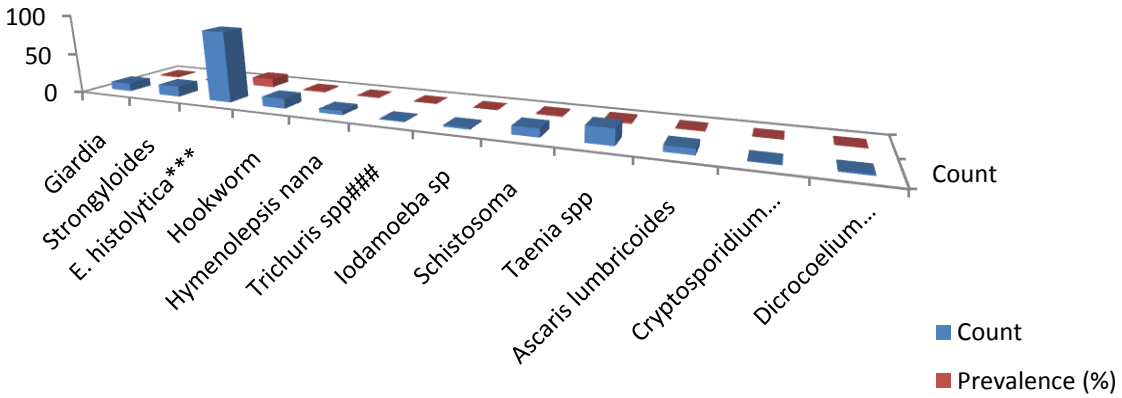

Figure 1: Graphical representation of count of IPIs in stool samples and Prevalence

DISCUSSION

The prevalence rate was highest for *E. histolytica* (protozoan parasite which causes of Amoabiasis) at 10.76%, followed by *Taenia* sp (cause of Taeniasis) at 2.32%, then *Strongyloides sp* (1.59%), Hookworm (1.47%) – all helminthic parasites, then *Giardia* (1.22%), Schistosoma (1.22%), *Hymenolepsis nana* (0.61%) and *Iodamoeba sp* (0.24%). All the other parasites that were recorded had a prevalence rate of 0.12% (1/818) – for *Trichuris, Cryptosporidium and Dicrocoelium dendriticum (Table 1; Figure 1)*. The overall prevalence rate was 20.7%.

In a study by Abaver et al (2011) in Abuja in North-central Nigeria, a very similar list of enteroparasites (IPIs)

were observed, with the highest prevalence rate being for *E. histolytica* at 6.7%, followed by hookworm (at 4.2% and *Ascaris lumbricoides* at 2.5%, and the least values being for *Taenia spp* and *T. trichura* at 0.8%. This result appears very similar to ours from this study, except that our overall prevalence rate of IPIs recorded from this study (at 20.7% - 169/818) was slightly lower than theirs (at 22.7% - 27/119) whose sample space was lower (but enough for statistical analysis) and not indicative of having a negative effects on their result.

However, in an extensive retrospective study in Malaysia (in another tropical climate, though with a slightly different geo-terrain) covering 42years for which data was retrieved from past literature on IPIs- the most common IPI encountered was *Trichuris trichiuria* (20.2% prevalence rate), followed by *Ascaris lumbricoides* (10.5%). No case of hookworm was reported in urban children whereas 12.2% of rural children were positive for IPIs, while the most common protozoan parasite was *Entamoeba coli* (3.2%), followed by *Giardia intestinalis* (1.8%) and *Blastocystis hominis* (1.2%) (Sinniah et al, 2014).Though the IPI with the highest peak of prevalence differed, there were some similarities in the pool of observed IPIs, as compared to our observations.

It should be noted that both single IPI and mixed IPI were observed among these patients examined in this study population, but this data was not engaged for analysis and inclusion in this article, as it was not within the scope of our study, coupled with the low pool of data we found on it (including several of these patients without data on this) which is required for complete analysis and generalization of its results.

Thus, a protozoan parasite *Entamoeba hystolytica* recorded the highest prevalence rate at 10.76%, with 8.44% gap and difference from the closest IPI which was *Taenia sp* (2.32%) a helminthic parasite. This indicates that the study population ought to pay the most attention to steps to curtail and prevent infection by the protozoan *E. histolytica* to which they appear to be most at risk of contacting than the other IPIs which were recorded. However, it does not mean they should neglect the other intestinal parasites with low or very lower prevalence rates in this study population.

It is estimated that 10% of the world's population is possibly infected with *E. histolytica* as either asymptomatic careers of symptomatic individuals (Brooks et al, 2004). The highest prevalences occur in the developing world (3rd world countries). *Entamoeeba histolytica* causes dysentery, diarrhoea, abdominal pain, weight loss and fever most commonly as the symptoms depending on the level of immunity of the individual and level of infection among other factors. At very advanced stages of infection and pathogenesis of disease progression, complications such as fulminant colitis, perforations in for of ulceric wounds, and liver abscess may manifest and feature as part of clinical manifestations of the disease.

Based on results from this study, *E. histolytica* appear to deserve attention from public health authorities considering the nature of burden they input into the communities affected. *Giardia lamblia* which in the study population had one of the few nearest figures of prevalence rate to *E. histolytica*, though still way behind has similar symptoms, risks of infection, prevention and control measures to *E. histolytica*. Also, they are both frequent pathogens in regions of the world were outbreaks of water borne diarrhoea are experienced. This possibly underscores the reasons behind this observational trend. The other two protozoans of *Iodamoeba* and *Cryptosporidium* recorded very low levels compared to *E. histolytica* and *Giardia* (Table 1; Figure 1). Apparently, they (*Iodamoeba* and *Cryptosporidium*) posed least public health importance and burden in the study population, apparently demanding less focus of attention compared the more infective *E. histolytica* and *Giardia*. Also, the helminthic parasites *Taenia*, *Strongyloides* and Hookworm had higher prevalence rates than other recorded helminthis IPIs of *Schistosoma*, *Hymenolepsis nana* and *Trichuris*. This indicates that the latter appear to be of the least public health burden in the study population compared to the former listed group with higher prevalence rate values. This risks to contacting *E. histolytica* the causative pathogen for amoeboiasis include unaware ingestion of faecally contaminated food, water, vegetable or water, while flies have been incriminated in areas of faecal pollution, as high carbohydrate, low protein diet have been shown to favor development of amoebic dysentery both in experimental animals and in human cases (Brooks et al, 2004). Thus, control measures ought to include re-enforcing of environmental and food sanitation. Notably also, many cases are asymptomatic and deserve measures in area of voluntary routine diagnostic tests by individuals.

Similarly, in a study in Kigali, Rwanda among students of a tertiary institution in which the prevalence was 50.5%, the prevalence of IP was strongly associated with drinking any kind of water and eating outside of the KIE Cafeteria, and significantly associated with living outside KIE campus (Niyizurugero et al, 2013). Abaver et al (2011) corroborated issues suggested in this article as possible attributable factors for incidence of IPs by adding that the provision of portable drinking water, sanitary facilities and health education on hygienic practices can help reduce the incidence of parasitic infections in populations.

CONCLUSION

E. histolytica requires more focus of public health attention in terms of re-enforcement of preventive measures than all the other parasites in the study population, followed by *Taenia*, *Strongyloides*, Hookworm and *Giardia* parasitic infections. However, the prevalence rate of *E. histolytica* is lower than that

recorded in some other tropical 3rd world regions of the world and higher than that in some other tropical 3rd world regions as highlighted above, with the least risk of infection in the developed world.

Trichuris, Cryptosporidium and *Dicrocoelium dendriticum* posed the least risk to the study population in terms of infection by these parasites, and as such require lest focus of attention by public health authorities in the area. This study appears expository and beneficial in its content for areas in the developing third world countries.

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