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Co-Infection of Soil-Transmitted Helminthes and Chistosomiasis among Residents along River Benue Adamawa State, Nigeria

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ABSTRACT

A survey of 1,404 participants within age bracket 5–55 and above years old within 10 communities across 5 LGA along River Benue, Adamawa State were randomly selected to determine the distribution of concomitant infection of Soil-transmitted Helminths (STH) and schistosomiasis in the study area. An approval from the State Ministry of Health was received before the commencement of the study. Stool and urine samples were collected and examined for eggs of Schistosomamansoni, S. haematobium, and STH. Questionnaire was used to obtain demographic information and to quantify exposure to the predisposition factors. On total of 5.2% concurrent infection that was observed with regard to co-infection between soil-transmitted helminthiasis and schistosomiasis across the community Kanti had 20(11.5%) as the most affected community with co-infection, while Kabawa 2.0% had the least, meanwhile, Ribado, Hoki and Kwale had no co-infection. In relation to Local Government Area, it was recorded that, Gerei LGA was the highest 9.8% with least of 1.0% recorded in Lamurde LGA. Examining the distribution by month and season, July in wet, and February in dry season had 11.1%, and 4.3% had the highest co-infection respectively, with no statistical difference (p>0.05). Age related prevalence showed that, age bracket 5-14 had 8.0% as the highest amongst the age groups; moreover, males had 6.8% compare to female counterpart which was recorded with 3.2% and there was no significant differences. The distribution of co-infection was highest among Fishermen (8.0%) and lowest among Civil servants 1.0% (p>0.05). Those fetching water from Streams/River were recorded with highest co-infection, while, those drinking from Borehole 1.4% had the lowest with no statistical difference (p>0.05), finally, Prevalence of STH infection and Schistosomiasis were observed to be highest among nearby bush users 6.9% than the pit latrine users (3.4%) with significant difference (p<0.05).

Keywords: *Co-Infection, Soil-transmitted Helminths, Schistosomiasis*

INTRODUCTION

Soil-transmitted helminthiasis and Schistosomiasis represent the most common neglected tropical diseases and may cause acute and chronic illness (World Health Organization 2011).It is estimates that almost 2 billion people are infected with one or more of these soil-transmitted helminths, accounting for up to 40% of the global morbidity from infectious diseases, exclusive of malaria (Ukpai, *et al.*, 2013) The greatest numbers of soil-transmitted helminth infections occur in tropical and subtropical regions of Asia, especially China, India and Southeast Asia, as well as Subsaharan Africa. Of the 1-2 billion soil-transmitted helminth infections worldwide, approximately 300 million infections result in severe morbidity, which are associated with the heaviest worm burdens (Hotez*et al.*, 2010) The public health importance of STH infections ranked highest in morbidity rate among school aged children who often present much heavy worms infections because of their vulnerability to nutritional deficiency (Hotez*et al.*, 2010). Meanwhile, Schistosomiasis is an acute and chronic parasitic disease caused by blood flukes (trematode worms) of the genus *Schistosoma*. Estimates show that at least 206.4 million people required preventive treatment in 2016. Preventive treatment, which should be repeated over a number of years, will reduce and prevent morbidity. Schistosomiasis transmission has been reported from 78 countries. However, preventive chemotherapy for schistosomiasis, where people and communities are targeted for large-scale treatment, is only required in 52 endemic countries with moderate-to-high transmission, with estimated 101 million persons at risk and 26 million people infected (WHO. 2018). Soil-transmitted helminthiasis is a type of helminthes infections caused by different species of roundworms. It is caused specifically by those worms which are transmitted through soil contaminated with faecal matter and are therefore called soil-transmitted helminthes. Four types of soil-transmitted helminthiasis can be distinguished: Ascariasis, Hookworm disease, Trichuriasis and Strongyliasis. These four types of infections are therefore caused by the large roundworm Ascaris lumbricoides; the hookworms (Necator americanus or Ancyclostoma duodenale), the whipworm (Trichuris trichiura) and Strongyloides tercoralis respectively. Nigeria is one of the countries known to be highly endemic for schistosomiasis, with estimated 101 milion persons at risk and 26 million people infected (Chitsulo*et al.*, 2010). Transmission and contact activities which varies between the communities.Mostata, *et al.* (2009) reported that, urinary schistosomiasis had the risk of causing haematuria, dysuria nutritional deficiencies, lesion of the bladder, kidney failure and elevated risk of bladder cancer and in children, growth retardations are well established and finally the work capacity of rural inhabitants is drastically reduces because of the weakness caused by the parasites.

MATERIAL AND METHODS

Study Area

Adamawa state is located in the north eastern part of Nigeria. It lies between latitude 7° and 11°N of the equator and between longitude 11° and 14° east of Greenwich Meridian. It shares boundary with Taraba state in the south and west Gombe state in its North West and Borno state to the North. Adamawa state has an international boundary with Cameroon Republic along its eastern border. The state covers a land mass of about 38.741 square kilometers, having mountainous land transverse by the major rivers of Benue, Gongola and Yadzaram. The total population is estimated is 3,178,950 according to census 2006, where 1,607,270 were Males and 1,571,680 are Females.

Study Site

The study was carried out in 10 communities selected in 5 LGAs along River Benue in Adamawa State. The selection was based on the population and the proximity of the community to the river Benue shore, which includes Fofure (Ribado and Dulo), Girie (Labondo and Kangle), Demsa (Zuran and Kwale), Numan (Bandawa and Kanti) and Lamurde (Kabawa and Hoki).

Population of the Study

Population of the study was randomly selected from communities along river Benue which includes children and adult male and female of different occupation across ten communities. Children that could not control their bowel and urination time were not enrolled for the study because of the early morning stool and urine nature of the sample collection. All adult participants were given verbal consent for participation,Parents or guardians were given verbal consent on behalf of their children and wards. Children over 12 years of age were given a verbal consent also. One thousand four hundred (1,404) volunteers were randomly

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selected across the Local Government Areas. Before commencing the research work, ethical clearance was obtained from State Ministry of Health Yola.

Sampling and Sample Collection

Two well labeled wide-mouthed specimens bottles were given to one thousand four hundred and four (1,404) participants, and they were instructed on how to collect their faecal and urine samples without contamination, the samples were immediately convey to Agape Medical laboratory and Diagnosis Yola and IIDP Laboratory MAUTECH. Yola, for macroscopy and Microscopy. Basically, two methods was used for parasitological stool analysis; direct normal saline wet mount and formal ether concentration technique which is considered as the most sensitive for most intestinal parasites (Cheesbrough, 2002). Sedimentation technique was adopted for isolation of Terminal spine ova of *S. haematobium* (Cheesbrough, 2005). Each participant was given a demographic questionnaire as regard to information about name, sex, age, location, educational qualification and other factors that encourage infection

Data Analysis

Data were analyzed with SPSS, version 22. Percentages, charts and graphs were used to express the prevalence, ANOVA and Chi-square test and correlation regression were also used to analyze the differences, association and relationship of the findings. Where $p<0.05$ was considered as significant and $p>0.05$ as insignificant.

RESULTS

On the overall 17.0% STH infection and 23.2% Schistosomiasis that were recorded as single infection, 5.2% concurrent infection was also observed with significant association ($p<0.05$). However, co-infection between soil-transmitted helminthiasis and schistosomiasis across the community showed that Kanti has 20(11.5%) as the most affected community with co-infection, while Kabawa (2.0%) had the least, meanwhile, Ribado, Hoki and Kwale had no co-infection (figure.1). Co-infection in relation to Local Government Area revealed that, Gerei Local Government Area was highly co-infected than Fufore Local Government Area, Demsa Local Government Area, Numan Local Government Area and the least were observed in Lamurde Local Government Area with 9.8%, 2.1%, 4.2%, 8.3% and 1.0% respectively (figure. 2). Moreover, Figure 3 showed persistence decrease of co-infection in relation to month from July 26(11.1%) being the highest to September and from February to March being the lowest, however, there was no co-infection recorded in the month of April. Meanwhile, Figure 4 recorded 49(7.0%) and 24(5.2%) cases of co-infection in wet and dry season respectively, with high rate in wet season than in dry season. The distribution of co-infection in soil-transmitted helminthiasis and schistosomiasis in relation to age among the subjects showed a persistent decrease as the age increases, with highest cases recorded among age bracket 5-14, 8.0% and there were no co-infections were recorded among age bracket 55 years and above (figure 5).The prevalence of co-infection in relation to gender revealed that Males had high percentage of 6.8% while 3.2% were observed among Females with no statistical significant difference ($p>0.05$). However, the frequency of co-infection of soil-transmitted helminthiasis and schistosomiasis in relation to occupation is

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as shown in figure 7. Which showed that out of 73(5.2%) co-infection cases, it was noted that fisher Men and Women 16(8.0%) are frequently affected while Civil Servants 2(1.0%) had not been recorded with co-infection and there was no significant statistical difference (P> 0.05). The occurrence of co-infection between soil-transmitted helminthiasis and schistosomiasis in relation to source of water is as shown in figure 8. The breakdown consists of 5(1.4%), 21(4.0%) and 47(9.1%) in Borehole, Well and River/Stream accordingly with no significant difference (p>0.05). Figure 9 shows the prevalence of co-infection in relation to Toilet system where 3.4% was observed among subjects that use Pit Toilet and 6.9% was observed among those using nearby bush for excretion with no statistical difference (p<0.05).

Figure 4.5: Frequency of Co-infection between STH and Schistosomiasis by Community

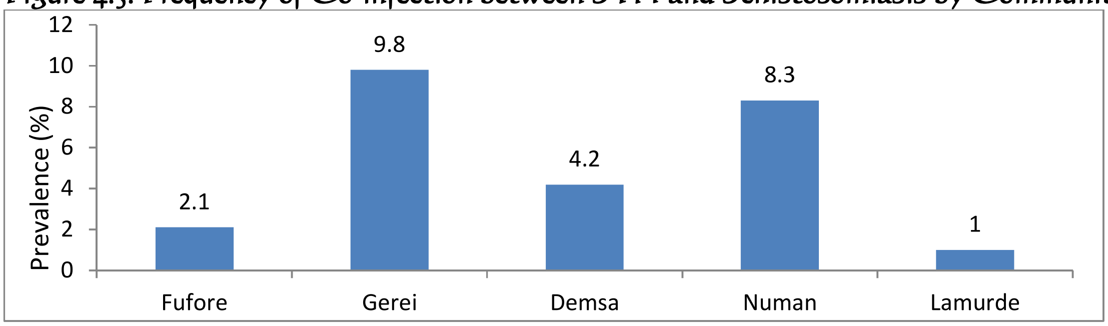

Figure 4.5.1: Frequency of Co-infection between STH and Schistosomiasis by LGA

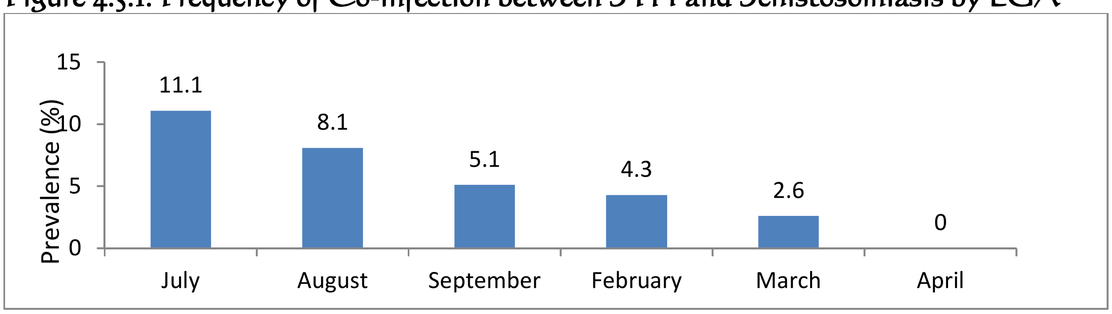

Figure 4.5.2: Frequency of Co-infection between STH and Schistosomiasis by Month

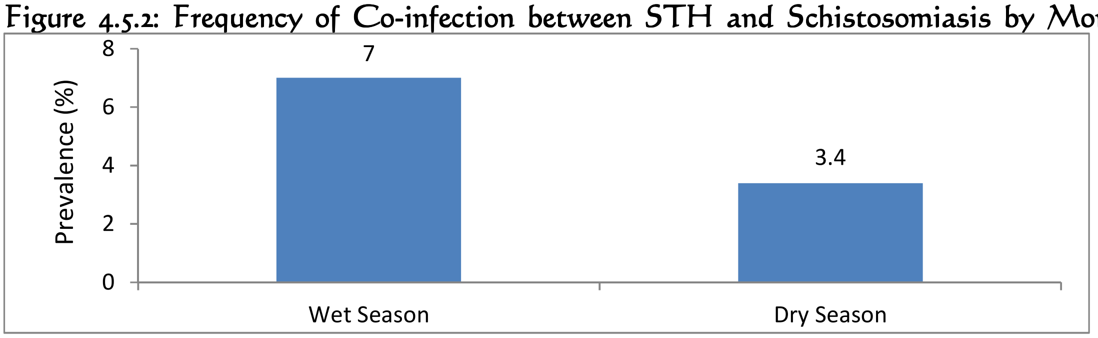

Figure 4.5.3: Frequency of Co-infection between STH and Schistosomiasis by Season

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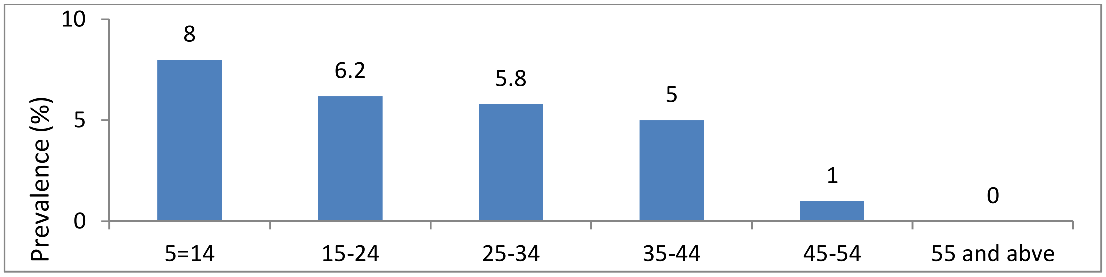


Figure 4.5.6: Distribution of Co-infection between STH and Schistosomiasis by Age

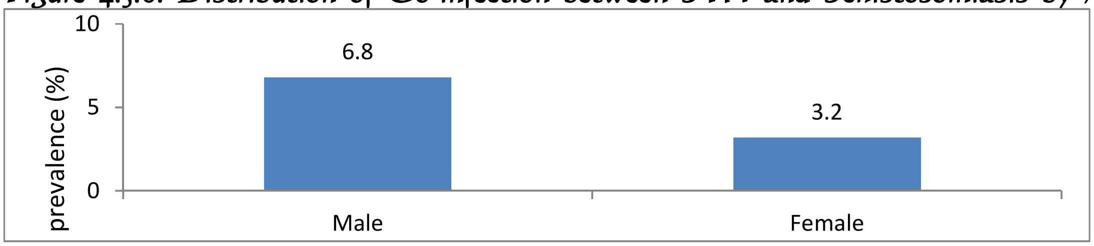


Figure 4.5.7: Distribution of Co-infection between STH and Schistosomiasis by Gender

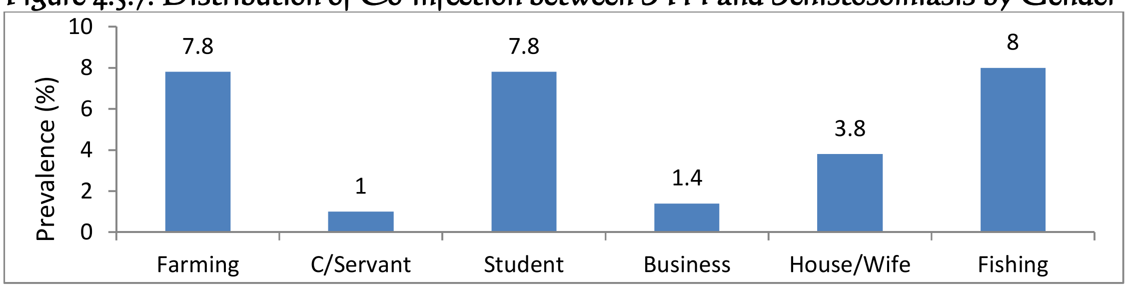


Figure 4.5.8: Distribution of Co-infection between STH and Schistosomiasis by Occupation

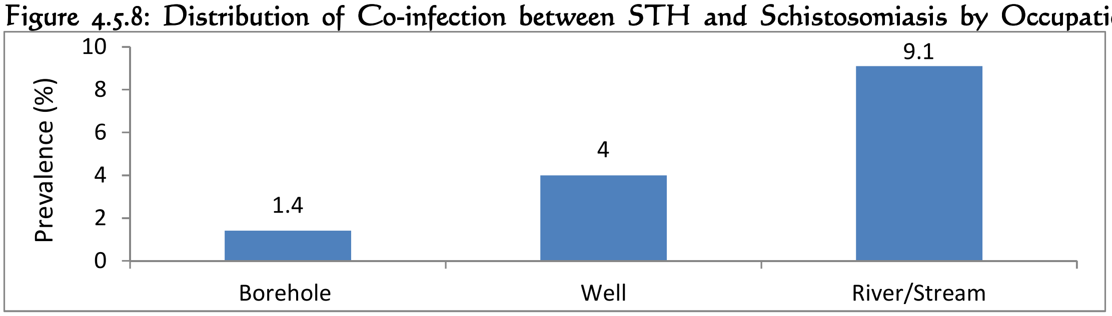
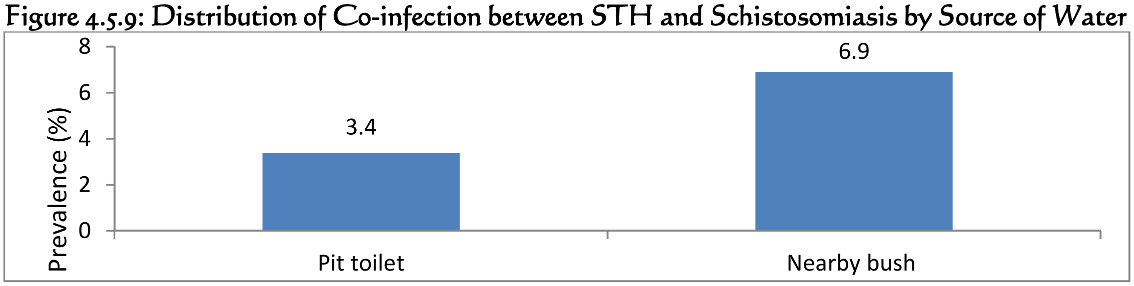


Figure 4.5.9: Distribution of Co-infection between STH and Schistosomiasis by Source of Water



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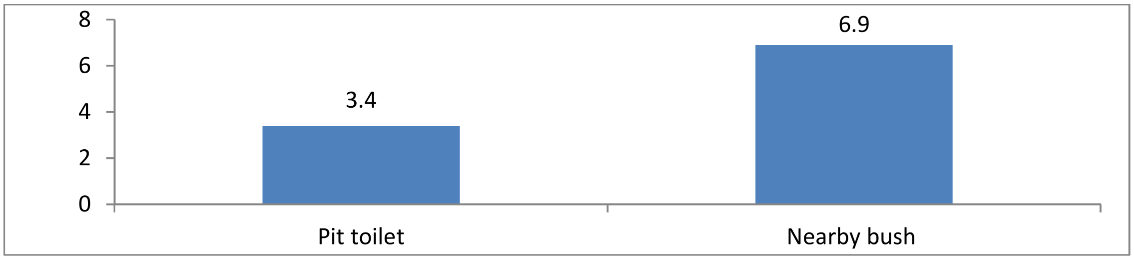

Figure 4.5.10: Distribution of Co-infection between STH and Chistosomiasis According Toilet System

DISCUSSION

The results of this research revealed a low incidence of co-infection between STH and Schistosomiasis in the study area. Although there is paucity of published articles on STH and Schistosomiasis co-infection, but however, overall distribution of co-infection was 73(5.2%) representing the entire subjects of 1404 with significant association ($p<0.05$). The association between the two infections could probably be traced to the level of immunity of sampled population. It could also be due to mass campaign on helminthes infection in the State which could bring about low transmission rate among the population. Although, some previous Authors (Thomas *et al.*, 2003; Abebe et al., 2011 and Adekolaet *al.*, 2014) reported 16.3%, 68.4% and 54.3% co-infection between STH and schistosomiasis, this could be as a result of hygienic differences of the study area. Kanti was observed with the highest cases of co-infection (11.5%) which is in line with the report of Agbolade, *et al.* (2007) who recorded 20.6% co-infection between STH and urinary Schistosomiasis in Saki Town of Oyo State, while, Gerei LGA had the highest co-infection across LGA with 9.8% compare to Lamurde which has only 1.0% and there was no statistical differences ($p>0.0$), this result is contrary with the work of (Adefioyeet *al.*, 2011) which revealed 52.0% co-infection of STH and Schistosomiasis in their studies, this could be as a result low water contact activities in this present study. Infection with respect to month and season showed little increase in July (11.1%) and in wet season (7.0%) and this may be associated with the over flooding of the river in the rainy season, 8.0% co-infection was also recorded among age bracket 5-14 and is in line with (World Bank, 2003) according report, School-age children typically have the highest intensity of worm infection of any age group. Moreover, males had 6.8% compare to 3.2% co-infection in females and it may be as a result of their engagement as a household. Famers has the highest prevalence in occupation related co-infection with 7.8% with only 1.0% recorded among C/servants with no significant statistical difference ($P>0.05$). However, co-infection in relation to source of water indicated 9.1% and 1.4% among those fetching water from River and Borehole respectively with no statistical differences ($p>0.05$) and it is also in line with the work of (Abebe*et a*l., 2011) that revealed STH and schistosomiasis as co-endemic in their study area . Finally, those using nearby bush had the highest co-infection 6.9% with co-infection recorded among those using pit latrine with statistical significant difference ($p<0.05$). The observed associations above are consistent with previous studies (Yajima*et al.*, 2011 and Stothard*et al.*, 2009) and contribute to the evidence showing that co-infection occurs in areas endemic for Schistosomiasis. This present study shows that the prevalence of STH and Schistosomiasis co-infectionwas within the same range as reported previously in other areas (Appleton *et al.*, 2006; Appleton *et al.*, 1999 and Jinadhai*et al.*, 2001) Our study only included participants who provided both urine and stool samples, but there was no difference between the included and excluded girls in terms of household size, water contact and age.

CONCLUSION

Considering the significant and association between STH infection and schistosomiasis shown in this study, using *S. haematobium*a as predictor for STHs, at least in rural parts of Adamawa State where urogenital schistosomiasis is endemic, may facilitate the processes of planning interventions. Stool sampling and analyses are laborious and the faecal collection may be challenging as a result of age and cultural differences of the study participants. This study has clearly demonstrated the occurrence of STH infection and schistosomiasis in the study area. The infections recorded could be due to reasons, like unhygienic environment, socio-cultural issues, lack of proper health education and public amenities such as toilet and potable water. In addition ignorance could be one of the factors.

RECOMMENDATION

Given the findings of many researchers on STH and schistosomiasis co- infection, one should like to recommend in line with pass experience which may attract intervention programmes that can bring about significant decrease in the infections within a short period of time should be advocated.

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