Prevalence and effect of Schistosome and soil-transmitted helminth infection on labour input in rice-growing communities of Ogun State, Nigeria

Sammy Olufemi Sam-Wobo[1], Olushola Akintola[1], Jonathan Atungwu[2], Uwem Friday Ekpo[1], Monsuru Alani Adeleke[3], Chiedu Felix Mafiana[4]

ABSTRACT

Schistosomiasis and soil-transmitted helminthiasis (STH) are public health problems in communities which lack basic social amenities with poor hygienic conditions. Studies were carried out to determine the prevalence and effect of schistosomes and soil-transmitted helminths infection on labour input on rice production in 9 rice-growing communities of Ogun State. Parasitological examinations of urine and faecal samples, and structured questionnaires were conducted on 243 consented individuals from May 2009 to March 2010. The results showed an overall prevalence of 17% for *Ascaris lumbricoides*, 12% for hookworms, 2% for *Trichuris trichiura*, 1% for *Schistosoma haematobium* and 1% for *Schistosoma mansoni*. *A. lumbricoides* and hookworms were more prevalent in Agbajege (25%), and varied in the other 8 communities. *T. trichiura* was prevalent in three communities, Agbajege (5%), Akodu (4.2%), and Moloko-Asipa (4.8 %); *S. haematobium* was prevalent only in Ayedere (2.6%) and Lufoko (8%), while *S. mansoni* was prevalent only in Moloko-Asipa (9.5%). Infections among the gender were varied as 26.3 % of males and 33.8 % of females had an overall prevalence of: *A. lumbricoides* (16.8%), hookworms (11.8%), *T. trichiura* (1.6%), *S. haematobium* (1.1%) and *S. mansoni* (1.1%). On frequency of infection to incapacitation per year, 45% of respondents were incapacitated 1-2 times, 27% 3-4 times and 19% were incapacitated more than 4 times. Understanding the effect of these two diseases will not only improve the health status of residents but also increase their productivity and ensure food security.

Key words: Schistosomes; Soil transmitted helminthes; Labour-input; Rice-communities; Ogun State

(1) Parasitology Unit, Department of Biological Sciences, University of Agriculture, Abeokuta, Nigeria
(2) Department of Crop Protection, University of Agriculture, Abeokuta, Nigeria
(3) Department of Biological Sciences, Osun State University, Oshogbo, Nigeria
(4) Executive Secretary Office, National University Commission, Abuja, Nigeria

CORRESPONDING AUTHOR: *Parasitology Unit, Department of Biological Sciences, University of Agriculture, PMB 2240, Abeokuta 110001, Nigeria.*
e-mail: sammywobo@gmail.com
DOI: ***10.2427/8841***

INTRODUCTION

The prevalence of human helminth infections had been reported in many rural communities of the developing world with emphasis on soil-transmitted helminthiasis (STH) and schistosomiasis [1, 2, 3] and global estimates of infections had been put at over 2

billion, of which ascariasis account for about 1.6 billion while trichuriasis and hookworm amount to about 700-800 million, schistosomiasis which is considered the second most important water-based parasitic infection after malaria in terms of public health and economic impact affects 200 million people with over 600 million at risk of the disease [2, 4]. In Sub-Saharan Africa (SSA) they are recognized as important public health problems due to their immense contribution in undermining the health status of the people and jeopardizing economic development in the region [5, 6] and because transmission is soil and water-related, their epidemiology had been known to be affected by ecological changes caused by projects for the development of water resources and agriculture [7, 8]. There is therefore a growing discrepancy between Sub-Saharan Africa and the rest of the world in terms of disease burden resulting from lack of adequate control efforts [2, 9].

Of soil transmitted helminthiasis, many global and Nigerian studies had described ascariasis as the most prevalent, followed by hookworm infections and trichuriasis [10-14], while varying prevalences of schistosomiasis had been described in rice-growing communities and those near dams in West-Africa and Nigeria [15-18].

While infections had been associated with lack of sanitary facilities and farming [5, 19, 20, 21], they rarely cause death, and the burden of disease related to the chronic and insidious effects on host's health and nutritional status is most commonly associated with infections of heavy intensity, however, the effects of untreated helminth infections of any intensity are often difficult to measure and associating them with any particular parasite is even more challenging [3, 22, 23] .

In recent years a lot of resources and emphasis are being directed toward water resources development to boost agricultural productivity with little or no Health Impact Assessment (HIA) on the effect of STH and schistosomiasis as a result of the various agriculture-oriented environmental modifications on the farming communities [7, 24]. The increasing importance of rice in food and nutritional security, income generation, poverty alleviation and socio-economic growth of Africa, especially for a major rice consumer and importer like Nigeria [25] has made it necessary to investigate the effects of STH and schistosomiasis on the rice-growing communities. Thus, the present study was carried out in nine (9) rice-growing communities of Ogun State, South-western Nigeria to describe the prevalence and effects of helminthiasis among the communities.

METHODS

Study Area

The study was carried out in nine rice-growing rural communities in two Local Government Areas (LGA) of Ogun State, Nigeria (Figure 1). The communities, as shown in Figure 2, are Asipa Ilao, Abule Alaja, Ayedere, Kere in Ewekoro LGA; and Lukofo, Aiwere, Akodu, Agbajege and Moloko Asipa in Obafemi-Owode LGA. The communities had no access to conventional sanitary facilities, pipe borne water and electricity. The communities were selected based on their importance in local rice production as identified by the Rice Farmers' Association of Nigeria, Ogun State Chapter.

FIGURE 1
THE 2 LGAS (INSET MAP) OF OGUN STATE

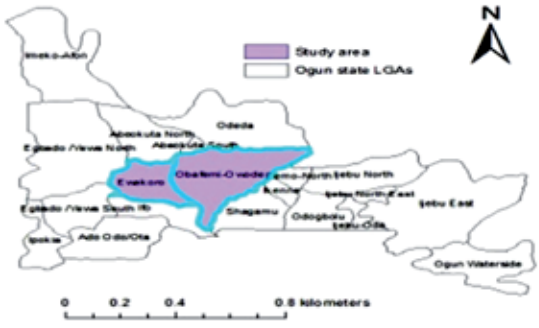


FIGURE 2
THE STUDY COMMUNITIES IN 2 LGAS

Sample size and measuring indices

The sample population was restricted to consented volunteers (adults and school age children) and young children whose parents or guardians had given their consent and are resident members of the communities. The study was conducted with 243 consented individuals from May 2009 to March 2010.

Consent

Consent and approval were obtained from each of the Local Government Area headquarters, the villages Heads or *"Baales"* of the communities, who also called community meetings where the purpose and procedure of the study was lucidly explained to the community members.

Examination of faecal samples

Properly labeled plastic containers with tight lids into which fresh specimen would be put on the morning appointed for the collection and examination of the faecal samples were provided for each participant. The specimens were collected for helminth examination using the Kato-Katz method. The egg per gram (epg) of faeces was calculated by multiplying the number of eggs in a 20 mg smear by 50. Determination of corrected epg of faeces was adjusted for dilution using stool consistency and multiplied by the correction factors according to [26]. Eggs and ova of parasites were observed under x40 magnification of the binocular microscope. The limitation of this was that eggs of hookworm species observed were not distinguishable between the two types of hookworm (*Ancylostoma duodenale and Necator americanus*).

Screening of urine sample for schistosomiasis

Urine samples were collected in properly labeled conventional 50 ml sample bottles put in black cellophane bags between 9:00 am and 12:00 noon from the participants. 10 ml of urine left in the bottles were kept in a dark cupboard for a minimum of 2 hours after which the supernatant was poured out and the sediment transferred on a slide, covered with a cover slip and examined under the light microscope using the x10 objective lens with the condenser sufficiently closed to give good contrast. The numbers of eggs of *S. haematobium* found on the preparation were reported as number of eggs per 10 ml of urine to indicate intensity of infection.

Knowledge Attitude and Practice (KAP)

The Knowledge, Attitude and Practice (KAP) of community members about illnesses, their causes and effects as well as the general sanitary behaviour in the communities were evaluated through structured questionnaires administered by the researchers to all participants, in addition to personal communication with prominent members of the community. The information sourced included the incapacitation associated with helminthiasis, frequency of incapacitation and the effect on their productivity. Illness is that state of not feeling well in the body, while incapacitation is termed the period or number of days that community members stayed at home and were unable to carry out farming activities.

Data analysis

Data gathered from the questionnaires were analyzed using Epi Info Software version 6.04, and laboratory investigations were entered in Microsoft Excel application and analyzed to obtain the frequencies, analysis of variance, interaction between and within parameters, in addition to test for significance using the Statistical Package for Social Science (SPSS) version 17.0 for windows.

RESULTS

Study population

The age and sex profile of the study population are presented in Table 1. The age distribution which is from age 2 years to over 40 years indicated that majority of the respondent are over 40 years with a frequency of 57% representing 138 members of the 243 member population. Across the study communities, males were 41%, while females were 59%.

TABLE 1

AGE AND SEX DISTRIBUTION OF RESPONDENTS IN THE STUDY AREA

COMMUNITIES	AGE GROUPS (%)					TOTAL (%)	SEX (%)		TOTAL (%)
	1-10	11-20	21-30	31-40	>40		MALE	FEMALE	
MOLOKO ASIPA	18.2	6.1	6.1	3.0	66.6	100	48.5	51.5	100
AGBAJEGE	20.0	5.0	10.0	15.0	50.0	100	40.0	60.0	100
AIWERE	16.1	9.7	6.5	16.1	51.6	100	51.6	48.4	100
LUFOKO	20.8	37.5	4.2	20.8	16.7	100	45.8	54.2	100
AKODU	0	8.3	4.2	8.3	79.2	100	25.0	75.0	100
OBAFEMI/ OWODE LGA	15.02	13.32	6.2	12.64	52.82	100	42.18	57.82	100
KERE	4.7	0	13.9	27.9	53.5	100	34.9	65.1	100
ALAJA	21.7	13.1	0	17.4	47.8	100	47.8	52.2	100
AYEDERE	0	0	5.3	15.8	78.9	100	31.6	68.4	100
ASIPA ILAO	6.5	12.9	12.9	12.9	54.8	100	41.9	58.1	100
EWEKORO LGA	8.0	7.0	8.0	18.0	59.0	100	39.1	61.9	100
AVERAGE	12.0	10.3	7.0	15.2	55.5	100	40.8	59.2	100

TABLE 2

PREVALENCE OF HELMINTH PARASITES IN STUDY COMMUNITIES OF OBAFEMI-OWODE LGA

COMMUNITY	*A. lumbricoides*			Hookworm			*T. trichiura*			*S. haematobium*			*S. mansoni*		
	NE	NI	%NI	NE	NI	%NI	NE	NI	%NI	NE	NI	%NI	NE	NI	%NI
MOLOKO/ ASIPA	21	4	19	21	5	23.8	21	1	4.8	21	0	0	21	2	9.5
LUFOKO	25	3	12	25	0	0	25	0	0	25	2	8	25	0	0
AIWERE	29	2	6.9	29	2	6.9	29	0	0	29	0	0	29	0	0
AKODU	24	4	16.7	24	2	8.3	24	1	4.2	24	0	0	24	0	0
AGBAJEGE	20	5	25	20	5	25	20	1	5	20	0	0	20	0	0
MEAN PREVALENCE	15.92%			12.8%			2.8%			1.6%			1.9%		

NE=Number examined; NI=Number infected; %NI=Percentage of Number Infected

Prevalence and effect of helminth infection on the study population

Prevalence of soil-transmitted helminths in Obafemi-Owode LGA showed that *A. lumbricoides* had a higher prevalence (15.92%), followed by hookworm (12.8%) and that *T. trichiura* had a low prevalence of 2.8%. For *Schistosoma* infections, prevalence for urinary schistosomiasis was 1.6% while was 1.9% for intestinal schistosomiasis (Table 2). In Ewekoro LGA, total prevalence was 17.7%, 10.8%, 0%, 0.7% and 0% for *A. lumbricoides*, hookworms, *T. trichiura, S. haematobium* and *S. mansoni,* respectively.

On the frequency of incapacitation associated with the diseases yearly by the study population, 45% of respondents reported that they were sick once or twice a year, 27% were sick three to four times a year, 19% were sick more than four times a year while 9.7% reported that they do not fall sick (Figure 3).

TABLE 3

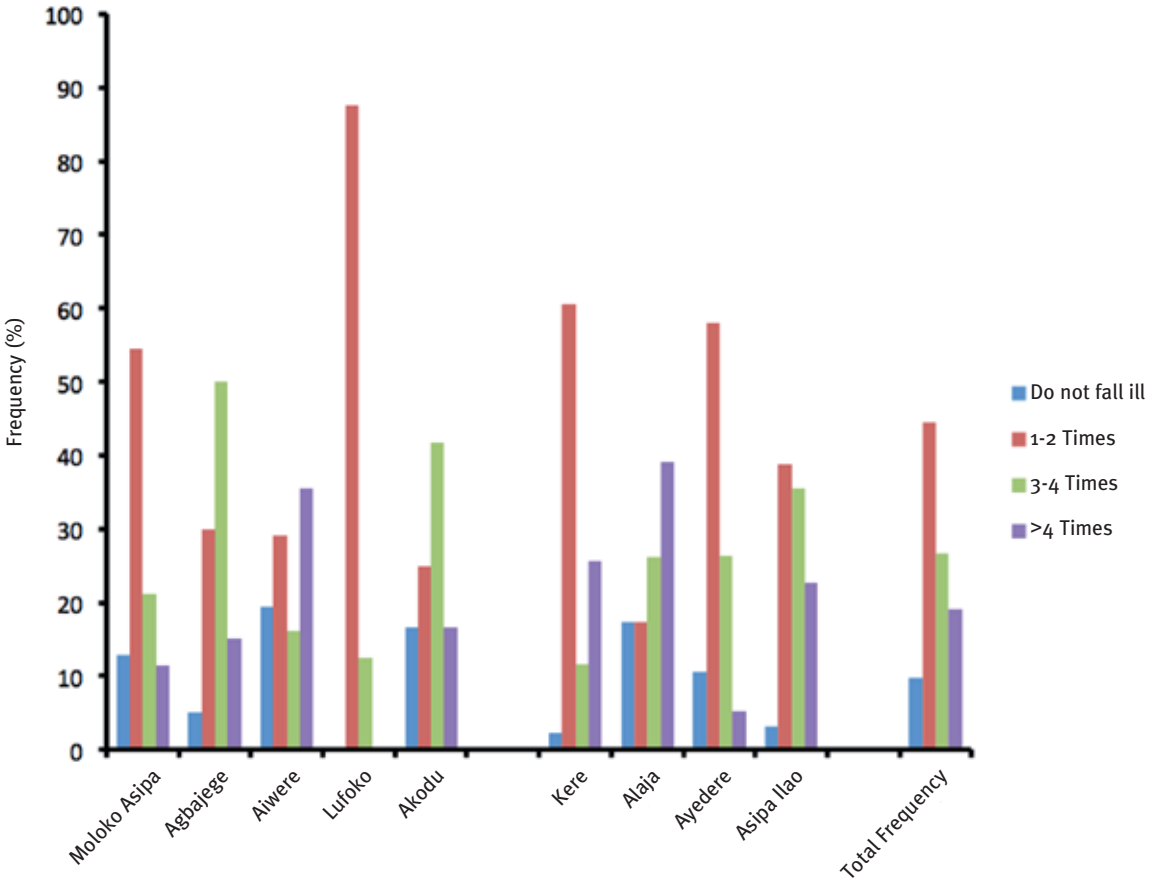
PREVALENCE OF HELMINTH PARASITES IN STUDY COMMUNITIES OF EWEKORO LGA

COMMUNITY	*A. lumbricoides*			Hookworm			*T. trichiura*			*S. haematobium*			*S. mansoni*		
	NE	NI	%NI	NE	NI	%NI	NE	NI	%NI	NE	NI	%NI	NE	NI	%NI
KERE	31	4	12.9	31	3	9.7	31	0	0	31	0	0	31	0	0
AYEDERE	38	9	23.7	38	3	7.9	38	0	0	38	1	2.6	38	0	0
ASIPA ILAO	32	4	12.5	32	4	12.5	32	0	0	32	0	0	32	0	0
ABULE ALAJA	23	5	21.7	23	3	13	23	0	0	23	0	0	23	0	0
MEAN PREVALENCE	17.7%			10.78%			0%			0.65%			0%		

NE=Number Examined; NI=Number Infected; %NI=Percentage of Number Infected

FIGURE 3

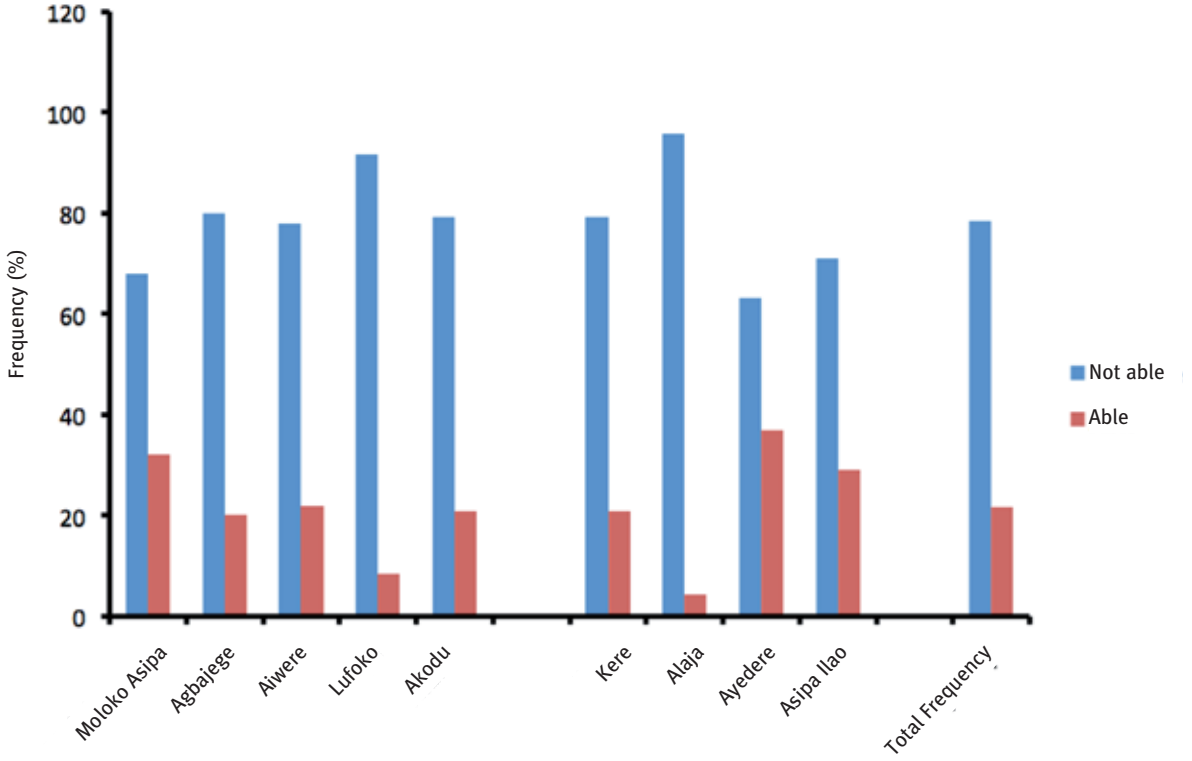
FREQUENCY OF INCAPACITATION EXPERIENCED PER YEAR AMONG RESPONDENTS IN THE STUDY AREAS



As a result of their incapacitation, 78.4% (Figure 4), reported that they were unable to work on the farm during the sickness and 21.6% reported that their illnesses did not prevent them from going to work on the farm.

FIGURE 4

RESPONDENTS' ABILITY TO FARM DESPITE INCAPACITATION IN THE STUDY AREAS



DISCUSSION

This study has attempted to describe the prevalence and effects of schistosomiasis and STH in rice-growing communities of Ogun State. Infection by *A. lumbricoides* remains the most prevalent followed by the hookworms and *T. trichiura* in consonance with the findings of [10-14] with highest point prevalence of 25% for both *A. lumbricoides* and hookworms infection and 5% for trichuriasis, there is however, a generally low prevalence of helminthiasis in the study area and more so for schistosomiasis in line with the findings of [15] in rice growing communities of West Africa. The reason for which may be that the rice ecology practice in the study area which is rain-fed and not flooded, limited the transmission of schistosomiasis. This also lends support to the findings of [7] and [8] that epidemiology of STH and schistosomiasis is affected by ecological modifications due to agriculture.

The effect of the burden of disease which could neither be directly evaluated nor associated with specific helminth infections in the study area as already confirmed by [22] and [23] is however indicative in the different frequencies of incapacitation reported per year by 90% of the study population and the consequent inability of about 78% of the population to do any farm work during these incapacitation. This finding reveals how helminthiasis could undermines people's health and jeopardizes economic growth as recognized by [5] and [6].

In conclusion, the present study has given insight on the prevalence and possible effects of helminthiasis on peoples' productivity in some rice-growing communities of Ogun State Nigeria. Though, the prevalence of helminthiasis is low which may not be unconnected to the relatively small sample population of the participants. This is however, the major limitation of the present study. Nevertheless, the prevalence could as a matter of time increase considerably if an effective anti-helminthiasis strategy is not instituted when considering the lack of social amenities and pipe borne water which could prevent indiscriminate refuse dumping and frequent visit to contaminated rivers.

The increase in prevalence would further render larger population unproductive and

aggravate their health burdens. The conditions will axiomatically hamper socio-economic development and food security. There is therefore a need for integrated disease interventions aiming at reducing the helminthiasis burden and increasing the productivity of the residents at the study area. Such interventions should include, among others, the treatment of the communities with paraziquantel and anti-helminthic drugs, periodic public health education on cleanliness, hand-washing and provision of basic social amenities such as pipe borne water, motorized borehole and public toilets. These measures will undoubtedly reduce the risks and burden of schistosomiasis and helminthiasis and improve the well-being and productivity of these farming communities.

ACKNOWLEDGEMENTS: *the authors appreciate the support and cooperation of the community heads and members, the local government officials and the officials of the Ogun State rice farmers association towards the study.*

References

[1] WHO (2004). Water, Sanitation and Hygiene Links to Health - FACTS AND FIGURES

[2] WHO (2008). First Inter-Ministerial Conference on Health and conference in Africa: Health security through Health environment. IMCHE/1/p8

[3] Bloomfield SF and Nath KJ. Use of ash and mud for hand-washing in low income communities. An IFH expert review 2009; published on http://www.Ifh-homehygiene.org. Nov 16, 2010, 9.40 am

[4] de'Silver NR, Brooker S, Hotez PJ, et al. Soil transmitted helminthes Infections: Updating the global picture. Trends in Parasitology 2003; 19(12): 547-51

[5] Anosike JC, Zaccheaus VO, Adeiyongo CM et al. Studies on the Intestinal Worm (Helminthiasis) Infection in a Central Nigerian Rural Community. JASEM 2006; 10(2): 61-66

[6] Odebunmi JF, Adefioye OA, Adeyeba OA. Hookworm Infection among School Children in Vom, Plateau State, Nigeria. America-Eurasian Journal of Scientific Research 2007; 2(1): 39-42

[7] Sow S, de Vlas SJ, Engels D, Gryseel B. Water-related disease patterns before and after the construction of Diama dam in Northern Senegal. Annals of Tropical Medicine and Parasitology 2002; 96(6): 575-86

[8] Fenwick A, Utzinger J. Helmintic Diseases: Schistosomiasis. International Encyclopedia of Public Health 2008; pp 351-361

[9] Engels D, Chitsulo L, Montressor A, Savioli L. The Global Epidemiology Situation of Schistosomiasis and New Approaches To Control And Research. Acta Tropica 2002; 82 (2): 139-46

[10] Asaolu SO, Holland CV, Jegede JO, et al. The prevalence and intensity of soil- transmitted helminthiasis in rural communities in Southern Nigeria. Annals of Tropical Medicine and Parasitology 1992; 86(3): 279-87

[11] Etim SE, Akpan PA. Study of Geophagy as Risk Factor for Geohelminthiasis in Calabar, Cross River State, Nigeria. Nigerian Journal of Parasitology 1999; 20: 91-8

[12] Ulukanligil M, Seyrek A. Demographic and parasitic infection status of school children and sanitary conditions of schools in Sanliurfa, Turkey. Public Health 2003; 3: 29

[13] Ameh IG, Onah JA, Amao RM. Intestinal Parasitiasis: Positive Cases and Low Haematocrit among Pregnant women at the antenatal clinic, Vom, Nigeria. Nigerian Journal of Parasitology 2004; 25: 33-8

[14] Ugbomoiko US, Onajole AT, Edungbola LD. Prevalence and intensity of geohelminths infection in Oba-lle Community of Osun State, Nigeria. Nigerian Journal of Parasitology 2006; 27: 62-7

[15] Gbakima AA. Inland valley swamp rice development; Malaria, Schistosomiasis, Onchocerciasis in south central Sierra Leone. Public Health 1994; 108(2): 149-57

[16] Ekpo UF, Mafiana CF. Epidemiological studies of urinary schistosomiasis in Ogun State Nigeria and Identification of high-risk communities. Nigerian Journal of Parasitology 2004; 25: 111-9

[17] Oladejo SO, Ofoezie IE. Unabated Schistosomiasis Transmission in Erinle River Dam, Osun State, Nigeria: evidence of neglect of environmental effects of developmental projects. Tropical Medicine and Environmental Health 2006; 11(6): 843-50

[18] Ugbomoiko US, Ofoezie IE, Okoye IC, Heukelbach J. Factors Associated With Urinary Schistosomiasis In Two Peri-Urban Communities In South-Western Nigeria. Annals of Tropical Medicine And Parasitology 2010; 104(5): 409-19

[19] Adams VJ, Markus MB, Adams JFA, et al. Paradoxical helminthiasis and Giardiasis in Cape Town, South

Africa: Epidemiology and Control. African Health Science 2005; 5(3): 276-80

[20] Sam-Wobo SO, Mafiana CF. The effects of surface soil physio-chemical properties on the prevalence of helminths in Ogun State, Nigeria. University of Zambia Journal of Science and Technology 2005; 9(2): 13-20

[21] Sam-Wobo SO, Oyeyemi OA, Idowu OA, Afolarin A. Assessment of health knowledge and risk factors associated with intestinal helminthes in tertiary schools in Abeokuta, Nigeria. Nigerian journal of Parasitology 2006; 27: 76-80

[22] Hotez PJ, Bundy DP, Beegle K, et al. Helminth infections; Soil-transmitted helminth Infections and Schistosomiasis (2006) The International Bank Reconstruction and Development/ The World Bank group Bookshelf/ NCBI/ NLM/NIH

[23] Steinmann P. Epidemiology and diagnosis of Schistosoma japonicum, other helminth infections and multiparasitism in Yunnan province, People's Republic of China. Inaugural Dissertation. Basel. 2008; pp. 32-33

[24] Curtale F, Hassanien YAW, Wakeel AE, et al. The school health programme in Behera: an integrated helminth control programme at Governorate level in Egypt. Acta Tropica 2003; 86: 295-307

[25] Defoer T, Wopereis MCS, Lancon F, et al. Challenges and Opportunities for Rice-Based Production Systems for Food Security and Poverty Alleviation in Sub-Sahara Africa. Proceedings of FAO Rice Conference, Rome, Italy 2004; pp 12-13

[26] Nawalinski TA, Schad GA, Choudhury AB. Hookworm burdens and faecal egg counts: An analysis of the biological basis of variation. Transaction of the Royal Society of Tropical Medicine and Hygiene 1978; 79: 812-25

*