ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 08, pp.35507-35512, August, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

HIGH INTESTINAL PARASITIC DISEASES AMONG FULANI PASTORALISTS IN RIVERS STATE, SOUTH-SOUTH NIGERIA

***Eze, Chinwe N. and Onoja Helen**

Department of Animal and Environmental Biology, Faculty of Science, University of Port Harcourt, Rivers State, Nigeria

ARTICLE INFO

Article History:
Received 10th May, 2016
Received in revised form
24th June, 2016
Accepted 27th July, 2016
Published online 20th August, 2016

Key words:

Pastoralists,
Bush encampments,
Intestinal parasites,
Polyparasitim.

ABSTRACT

This study was conducted to establish the prevalence of intestinal parasites among Fulani Pastoralists in six bush encampments in Rivers State, South-South Nigeria. Standard parasitological procedures as recommended by World Health Organization were employed in sample collection and examination. An overall prevalence of 91.2% was observed among the 593 stool samples examined with one or more of the intestinal parasites. Intestinal parasite rate by bush encampments showed that Fulani Pastoralists in Elelenwo and Eleme were the most infected with 109(94.8%) and 104(92.9%) prevalence respectively. The males showed a higher prevalence of intestinal parasites infections 347 (94.0%) than the females 194 (86.6%). However, this is not statistically significant ($p<0.05$). Age group 21-30 years had the highest prevalence of 95.0% followed by 11-20 (94.8%) and 31-40 (92.7%). About 90% of all the infected individuals are in the first to four decades of life. Also, 100% infection rate was observed among the age bracket 11-20years in Eleme bush encampment and 21-30 years in Elelenwo bush encampments. The difference in the rate of infection with respect to age was not statistically significant. Eleven parasitic intestinal diseases of which hookworm had the highest prevalence 450 (75.9%) was observed. Hookworm was highly significant from all the intestinal parasites ($p<0.05$) identified in this study. Polyparasitim of *A. lumbricoides* + *Hookworm* in the Population was 58(10.7%); *Hookworm* + *T. trichuris* 13(5.4%), *Hookworm* + *E. histolytica* 31(5.7%), *A. lumbricoides* + *Hookworm* + *Trichuris* 13(2.4%). The study has documented a very high prevalence of intestinal diseases among the Fulani pastoralists examined. There is a great need to monitor and control infection; otherwise they will remain a permanent source of health hazard for all intestinal diseases.

Citation: Eze, Chinwe N. and Onoja Helen, 2016. "High intestinal parasitic diseases among Fulani pastoralists in rivers state, South-South Nigeria", *International Journal of Current Research*, 8, (08), 35507-35512.

INTRODUCTION

Intestinal parasitic infections are amongst the most common infections throughout the world. Worldwide, about 3.5 billion people are affected, and 450 million are ill as a result of these infections, the majority being children (WHO 2013). Estimation of the global magnitude of morbidity and mortality due to parasitic infestations is a major concern (Phiri *et al*., 2000). Out of 1.45 billion infections due to Soil-Transmitted Helminths (STHs), 438.9 were infected with hookworm, 819.0 million with A. lumbricoides and 464.6 million with T. trichiura (Pullan *et al.,* 2010). STHs are the second leading cause of mortality in children of age less than 6 years who live in Africa (WHO 2010). Intestinal parasitic infections such as amoebiasis, ascariasis, hookworm infection and trichiruiasis are among the ten most common infections in the world (WHO 1987). Local conditions such as quality of domestic and village infrastructure, economic factors such as monthly income, employment, occupation and social factors such as education influence the risk of infection, disease transmission and associated morbidity and mortality (Wang 2009). These infections are more prevalent among the poor segments of the population. They are closely associated with low household income, poor personal and environmental sanitations, overcrowding, and limited access to clean water, tropical climate and low altitude. Intestinal parasitic infections still constitute one of the major causes of public health problems in the world, particularly in developing countries (Ekpenyong, 2008) Intestinal helminthes are more prevalent throughout the tropics, especially among poor communities. The fecal oral route is significant in the transmission of parasitic infections to

****Corresponding author: Eze, Chinwe N.***
Department of Animal and Environmental Biology, Faculty of Science, University of Port Harcourt, Rivers State, Nigeria.

human via poor personal hygiene and environmental conditions such as contaminated soil and water sources (Nyarango RM 2008). In Nigeria for instance a considerable amount of human and animal wastes are discharged into water bodies and soil untreated, leading to the infestation or contamination of water and soil with eggs and larvae of these helminthes. This therefore increases the probability of contact with faeces laden with geohelminth eggs and exposes individuals to possible risk of infections which is known to be acquired via the oral faecal route. Prevalence of these intestinal parasites is promoted by several epidemiological factors such as poor sanitation, environmental degradation, ignorance, poor personal and community hygiene, climate condition and other socio- cultural practice such as the use of night soil for fertilizer (Eneanya and Njom, 2003). Parasites are one of the important casual agents of diahorea, loss of weight, abdominal pain, nausea, vomiting, lack of appetite, abdominal distention and Iron deficiency anemia. The prevalence of different intestinal parasitic infections reported by different authors shows wide variations probably due to difference in place time and method used. Currently, there is scarcity of available literature regarding the prevalence of parasitic diseases among Fulani Pastoralists in Nigeria. The study was carried out to fill that gap. Therefore, the aim of this study was to determine the prevalence of intestinal parasitic diseases among Fulani Pastoralists in Rivers State, South-South Nigeria.

MATERIALS AND METHODS

Study Area and Study Population

A total of 593 herdsmen who voluntarily participated were randomly recruited from six bush encampments in Rivers State, Ahoada, Bori, Elele, Eleme, Elelenwo and Oyigbo where large population of Fulani herdsmen was located with their families. Rivers State lies at latitude 4º45'north and longitude 6º50'east and lies along Bonny River in the Niger Delta. Rivers State has tropical rainforests as well as mangrove and salt water swamps with an average rainfall of 2,500cm3. Temperature range between 28ºC to 33ºC which supports the rainforest type of vegetation and humidity range of 72% to 83% is high in the State throughout the year and decreases slightly in the dry season. Fulani's are the largest migratory ethnic group in the world. They are among 'super' ethnic groups of Africa with members numbering 15.3 million in Nigeria.

Settled Fulani's live in villages, towns, cities permanently and have given up nomadic life completely, in favour of an urban one. Fulani's are primarily pastoralists and they spend long times alone on foot, they can be seen very frequently in Rivers State parading with their cattle. The study population consists of Fulani pastoralists who have migrated and encamped in bushes in Rivers State from 2009 to 2011. The Fulani herdsmen were selected randomly (simple random sampling). Fulani pastoralists live with their families in the bush camps from where they herd their animals in search of green pasture. Most bush encampments in the study areas depend on pond, water bodies, shallow wells, seasonal streams and domestic water supply for drinking.

Pre-survey Contact and Consent Mobilization

Before the commencement of the study, advocacy visits were made to the Fulani heads called Seriki in all the bush encampments chosen for the study. They were duly consulted and this was necessary to ensure maximum co-operation from the Fulani's. Considering the strict socio-cultural and religious observances peculiar to the Fulani's, this preceded actual data collection. Oral consent was given by each Fulani before commencing this study.

Specimen collection

Stool specimen approximately 1gm was collected from each participant in a clean dry screw capped 20ml universal bottle and transported to the laboratory within 2 hours. Each of the stool specimens was examined both macroscopically and microscopically using saline preparation, Lugol's Iodine and Formal ether concentration techniques as described by Cheeesbrough**.** The Fulani Pastoralists that had intestinal parasites were treated with single dose of Albendazole.

Identification of ova, larvae, cysts and trophozoites of parasites

The characteristics used in the identification of eggs, larvae, cyst and trophozoites includes motility, shapes, sizes, and thickness of shell, special structure of the shell; mammillated covering, operculum, knob, spine, flagella and development stages of egg content (Dietrich *et al*., 1992). In the case of amoeba, cysts are identified by the numbers and position of nuclei presence and distribution of peripheral chromatin size and position of karyosome and presence of cytoplasm inclusion such as crematoidal bodies or glycogen are important for the identification of amoebic cysts (Cali *et al.,* 1993).

Statistical Analysis

The data collected from this study were subjected to statistical analysis using Statistical Package for Social Sciences (SPSS) for windows (version 17.0). Comparisons were made using Chi-square test of significance. Significance level was set at 0.05.

RESULTS

Bush Encampments and Sex- Related Prevalence of Intestinal Parasites among the Fulani Pastoralists in study areas

It was observed that out of the 593 stool samples examined 541(91.2%) were infected. Intestinal parasite infection by bush encampments showed that Fulani Pastoralists in Elelenwo and Eleme were the most infected with 109(94.8%) and 104(92.9%) prevalence respectively. However, there was no significance difference in the infection rates in the bush encampment sampled $p>0.05$. Infection by gender showed more prevalence of the intestinal parasites in the male 347(94.0%) than in the females 194(86.6%). There was significance difference in the infection rates between the two sexes $p<0.05$.

Table 1. Bush encampments and Sex-related prevalence of malaria infection

Bush encampments	Male		Female		Total	
	NE	NI(%)	NE	NI (%)	NE	NI (%)
Ahoada	57	52(91.2)	32	26(81.3)	89	78 (87.6)
Bori	45	42(93.3)	26	22(84.6)	71	64(90.1)
Elele	69	64(92.8)	36	30(83.3)	105	94(89.5)
Eleme	67	63(94.0)	45	41(91.1)	112	104(92.9)
Elelenwo	67	65(97.0)	48	44(91.7)	115	109(94.8)
Oyigbo	64	61(95.3)	37	31(83.8)	101	92(91.1)
Total	369	347(94.0)	224	194(86.6)	593	541(91.2)

NE=Number Examined; NI= Number Infected

Table 2. Age related prevalence of intestinal parasites among the fulani pastoralist in the study area

Bush encampments	No. examined	No. (%) infected		1-10	11-20	21-30	31-40	41-50	51 & above	% infected
Ahoda	89	78(87.6)	Nn	1412 (85.7)	2019 (95.0)	2220 (90.9)	1614 (87.5)	108 (80.0)	75 (71.4)	87.6
Bori	71	64(90.1)	Nn	109 (90.0)	1514 (93.3)	1413 (92.9)	1312 (92.3)	1211 (91.7)	75 (71.4)	90.1
Elele	105	94(89.5)	Nn	1816 (88.9)	2119 (90.5)	2221 (95.5)	2018 (90.0)	1412 (85.7)	108 (80.0)	89.5
Eleme	112	104(92.9)	Nn	2119 (90.5)	2222 (100)	2120 (95.2)	2019 (95.0)	1715 (88.2)	119 (81.8)	92.9
Elelenwo	115	109(94.8)	Nn	2120 (95.2)	2120 (95.2)	2323 (100)	2221 (95.5)	1615 (93.8)	1210 (83.3)	94.8
Oyigbo	101	92(91.1)	Nn	2220 (90.1)	1716 (94.1)	1918 (94.7)	1817 (94.4)	1311 (84.6)	1210 (83.3)	91.1
Over all Total	593	541(91.2)	Nn	10696(90.6)	116110 (94.8)	121115(95.0)	109101(92.7)	8272(87.8)	5947 (79.7)	91.2

N=no. examined
n=no. infected

Table 3. Prevalence of individual parasites among Fulani pastoralists in study areas

Parasites	Ahoada No. +ve (%)	Bori No. +ve (%)	Elele No. +ve (%)	Eleme No. +ve (%)	Elelenwo No. +ve (%)	Oyigbo No. +ve (%)	Total No. +ve (%)
	n = 78	n = 64	n = 94	n = 104	n = 109	n = 92	n = 541
A.lumbricoides	9(11.5)	11(17.2)	21(22.3)	17(16.3)	24(22.0)	16(17.4)	98 (18.1)
Hookworm	67(85.9)	53(82.8)	76(80.9)	84(80.8)	91(83.5)	79(85.9)	450(83.1)
T. trichuris	3(3.8)	5(7.8)	7(7.4)	14(13.5)	7(6.4)	8(8.7)	44 (8.1)
E. histolytica	7(9.0)	7(10.9)	5(5.3)	12(11.5)	9(8.3)	4(4.3)	44 (8.1)
S. mansoni	5(6.4)	6(9.4)	6(6.4)	6(5.8)	8(7.3)	9(9.8)	40 (7.4)
Taenia spp	-	-	3(3.2)	1(1.0)	1(0.9)	-	5 (0.92)
E. vermicularis	3(3.8)	1(1.6)	4(4.3)	4(3.8)	3(2.8)	3(3.3)	18 (3.3)
S. stercoralis	2(2.6)	6(9.4)	3(3.2)	4(3.8)	4(3.7)	6(6.5)	25 (4.6)
G.lamblia	3(3.8)	4(6.3)	3(3.2)	5(4.8)	4(3.7)	3(3.3)	22 (4.1)
E.coli	-	-	-	2(1.9)	1(0.9)	-	3 (0.6)
Fasciola spp	-	-	-	-	1(0.9)	1(1.1)	2 (0.4)

Table 4. Percentage occurrences of Polyparasitism among the Fulani pastoralists in Rivers State

Mixed infections	No. (%) positive
Ascaris + Hookworm	58 (9.7)
Ascaris + *T. trichuris*	13 (2.3)
Ascaris + *T. trichuris* +Hookworm	13 (2.3)
Ascaris + *S. mansoni*	8 (1.3)
Ascaris + *S. stecoralis*	3 (0.5)
Hookworm + *T. trichuris*	29 (4.8)
Hookworm + *E. histolytica*	31(5.2)
Hookworm + *S. mansoni*	21 (3.5)
Hookworm + *Taenia spp*	4 (0.7)
Hookworm + *G. lambila*	13 (2.3)
Total	193 (32.5)

Age distribution of gastro intestinal parasites among the Fulani pastoralists in Rivers State

Table 2 shows consistent high prevalence of intestinal infection in all age groups among the Fulani's 90.6%, 94.8%, 95.0% and 92.7% among the age groups 1-10, 11-20, 21-30 and 31-40 respectively. The difference in the rate of infection with respect to age was not statistically significant.

Age bracket of 21-30 years had the highest prevalence of (95.0%) followed by 11-20 years (94.8%) and 31-40 (92.7%). However, 100% infection rate was observed among the age group 11-20 years and 21-30 years in Eleme and Elelenwo bush encampments.

Plate a

Plate b

Plate c

Pictures depict sources of water in three bush encampments in Rivers State

Individual parasites among Fulani pastoralists in study areas

Table 3 shows that of the 541 that were infected eleven different species of parasites could be identified among the Fulani pastoralists in Rivers State. They include *Ascaris lumbricoides*, hookworm, *Trichuris trichuria, Entamoeba histolytica, Schistosoma mansoni, Taenia saginata, Enterobius vermicularis, Strongyloides stercoralis, Entamoeba coli, Giardia lambia and Fasciola* spp. Of these parasites, hookworm had the highest prevalence rate 450(83.1%), followed by *A. lumbricoides* 98(18.1%). *T. trichuris* and *E. histolytica* had the same prevalence rate of 44(8.1%) while *S. mansoni* had 40 (7.4%) prevalence. Only two Fulani pastoralists were observed with *Fasciola spp.*

Occurrences of Polyparasitism among the Fulani pastoralists in Rivers State

The most frequently encountered multiple parasitism was that involving *Ascaris lumbrico*ides and hookworm 58(9.7%) followed by Hookworm and E. histolytica 31(5.2%) while Hookworm and *T. trichuris* 29(4.8%). The least occurrence was *Ascaris lumbricoides* and *Strongyloides stercoralis*. *A. lumbricoides*, *Hookworm* and *Trichuris trichuria* 13(2.3%). The triple combination was a remarkable epidemiological picture of the study locations.

DISCUSSION

The study revealed the presence of heavy worm burden among 541 (91.2%) Fulani Pastoralists which is consistent with the findings of Ugbomoiko *et al.* (2006) in his study in Osun State, recorded 95.7% prevalence and Akinboye *et al.* (2010) recorded 81.8% prevalence among workers and inmates in a Nigeria zoo. But differ from Anosike *et al.* (2004) who recorded 42.4% among the nomadic Fulani's of South-eastern Nigeria. The high prevalence of helminthes infections recorded in this group could be attributed to exposure of individuals to predisposing factors to parasitic infections, poor sanitary conditions, inadequate methods of disposal of human waste (excreta); poor personal hygiene, overcrowding, low economic status, poor housing, lack of safe water supply and health facilities, low standard of education coupled with ignorance. It also indicates the level of hygienic practices exhibited by this group. Level of personal hygiene and environmental sanitary conditions in the bush camps are low. Indiscriminate defecation both from the animals was a common practice seen around their camps. Irregular wearing of shoes; loose slippers which expose part of their feet to the soil, common practice of

eating from one plate with bare hands was observed among the males. Moreover, through the practice of ablution they can be re-infected and the feet of animals could serve as transport agents. Fulani pastoralists get their water from streams, shallow-dug wells and rain-water harvested from thatched roofs. These water sources are not usually covered, hence they are predisposed to contamination by waste including human and animal faeces containing cysts, ova and or larva spread by vectors such as flies (Fashuyi, 1983 and WHO, 1987.) Chances of ingesting parasites cyst or ova in water are thereby greatly enhanced. The prevalence of intestinal parasites by sex showed that more males were infected than their female counterparts. This agrees with the findings of Gundiri and Okwuosa, (2005); Pukuma and Sale, (2006); Atu *et al.* (2006); Adeoye *et al.,* (2007); Sam-Wobo *et al.* (2008); Amadi *et al.* (2010) and Ogbuagu *et al.,* (2010) but differs from Obiukwu *et al.* (2008). This may be due to behavioural patterns or activities of the individuals such as boys accompanying their fathers during herding, common feeding pattern among the men. Prevalence was not dependent on sex among the sampled population which disagrees with the work of Atu *et al.,* (2006), who observed a higher prevalence of intestinal parasite in females than in males. Age group 21-30 years (95.0%) showed highest prevalence amongst the age groups examined. They are regarded as the productive age group and they spend most of their time in contact with the soil, animals and water in the process of farming and herding. Decrease in prevalence rate in the age group 41years and above when compared to 21-30 years was an indication that 41years and above was the less productive age group. With less contact to factors that predispose them to frequent infection. This may be attributed to immunity developed by the older individuals. However, 100% prevalence infection rate was recorded among 11-20years and 21-30 years in Eleme and Elelenwo communities among the Fulani's. This disparity could be due to varying environmental conditions coupled with the very deplorable state of environmental hygiene. Poor sanitary conditions, lack of safe water supply, procuring their drinking water from unclean sources and absence of health facilities in their various camps (See the pictures). Transmission of infection can also be during outdoor play with no slippers or shoes on soil contaminated with feaces. Also the contaminative attitudes of the children by ways of ingesting helminth eggs in contaminated food or drinking water, eating with or licking unwashed contaminated hands/fingers, and having foods uncovered which was common practice observed during this survey (personal Observation). Combination of defecating in open spaces, playing in soil and the geophagus habit of the children could be a good source of high intestinal infections (Etim and Akpan, 1999). Common intestinal helminthes encountered were *Ascaris lumbricoides,* hookworm*, Trichuris trichuria, Strongyloides stercoralis, E. histolytica, S. mansoni , Taemia* spp, *E. vermicularis, G. lamblia, E. coli,* and *Fasciola spp.* The presence of different worms among the infected population is usual and common feature of the epidemiology of intestinal helminth parasites in the rural areas of the tropics. *Ascaris lumbricoides* was found in all the bush encampments that were investigated. The prevalence was however, low compared with results of Shitta and Akogun, (2004) who reported a prevalence of 48% among the nomadic Fulanis of Northern Nigeria. While Anosike *et al.,* (2004) reported a prevalence of 6.2% and Adeoye *et al.,* (2007) reported a prevalence of (29.7%). Infection is spread through eggs, which are swallowed as a result of ingestion of contaminated soil or contact between mouth and the various objects carrying the adherent eggs. Contamination of food or drink by dust and handling could be another source of infection. *Ascariasis* ova are spread through the agents of flood and coprophagous animals can thus be transported to locations far from the defecation sites (Obiamiwe and Nmorsi, 1990). The well-protected eggs can withstand drying and can survive for very lengthy periods. Soil pollution is thus a major factor in the epidemiology of human *ascariasis*. *Amoebiasis* occurs throughout both tropical and temperate climates, but infections are more rampant in the tropics. Infection occurs through transmission of viable cysts by direct contact with contaminated foods and also through the intermediary of filthy flies and contaminated hands of human cysts carriers. Flies (*Musca domestica)* distributions were seen abundantly in the bush encampments this could be as a result of deplorable state, poor sanitary condition of the bush encampments and the unhygienic habits of eating on one plate, non washing of hands and not covering of foods (Personal observation).

The low prevalence of *Taenia* sp. could be related to dietary custom, pork rarely features in the diet of the Moslems faithful hence they have lesser chance of being infected by *T. solium*. More so, the low prevalence of *Taenia* sp. observed among the Fulani's could be attributed to the low habit of eating suya which is veritable source of *Taenia* infection. The occurrence of multiple parasitisms in this study compares favourably with that observed in other parts of the country Ukpan and Ugwu (2003), Amadi *et al.* (2010). Also, mixed infection occurred among the Fulani herdsmen. It would be pointed here that poor personal hygiene and environmental sanitation could have promoted this. Finally, majority of the subjects were found to have skin diseases especially among the children this could be as a result of shortage of water in the bush encampments. However, this calls for further investigation among the pastoralists.

In conclusion

The prevalence is very high as compared to other studies and these findings suggest that there is poor awareness of personal hygiene and sanitary practices among the Fulani pastoralists in the six bush encampments.

Acknowledgement

We are grateful to 34 Field Artillery Brigade for ensuring our safety during the field work. We also appreciate all our interpreters in Fulani and Hausa languages in the various bush encampments.

Conflict of interests

The authors have not declared any conflict of interest

REFERENCES

Adeoye, G.O; Osayemi, C.O; Oteniya, O and Onyemekeihia, S.O 2007. Epidemiological studies of intestinal helminthes

and malaria among children in Lagos, Nigeria. *Pakistan Journal of Biological Sciences;* 10 (13) pp.: 2208-2212.

Akinboye, D.O; Ogunfeitimi, A.A; Fawole, O; Agbolade O; Ayinde, O.O; Atulomah, N.O.S; Amosu, A.M and livingStone, R. 2010. Control of parasitic infections among workers and inmates in a Nigerian zoo. *The Nigerian Journal of Parasitology,* vol. 31: 35-38.

Amadi, E.C; Ebenizer A; and Azuonwu, O 2010. The influence of community ecology and behaviour on the bionomics of intestinal helminthiasis in parts of Niger Delta, Nigeria. *Nig. Journal of parasitol*, 79-83

Anosike, J. C; Bertram E.B. Nwoke; Celestine O. E. Onwliri; Charles E. Obiukwu; Akuchinyere F. Duru; Micheal I. Nwachukwu; Chnyere N. Ukaga 2004. Prevalence of parasitic diseases among Nomadic Fulani's of South-Eastern Nigeria. *Ann Agric Environ Med*, 11: 221-225.

Atu, B.O, Galadima, M and Alice, F. 2006. Prevalence of intestinal parasites in Etulo Benue State, Nigeria. *Nig. Journal of parasitol;* vol. 7: 1-6.

Awasthi S, Bundy DA, Savioli L. 2003. Helminth infections. British Medical Journal 327:431-433

Cali AD, Cedrik AM, Payfarr HL, Ivan M, Derek W, Rosemund W, Ray MA 1993. Parasite of intestine. Trop. Med. 3:15.

Celikoz A, Guler N, Guler G, Oztop AY, Degeril S. 2005. Prevalence of intestinal parasites in three socioeconomically different regions of Sivas, Turkey. *J Health Popul Nutr*., 23:184-91.

Cheesbrough M 2006. District laboratory practice in tropical countries: Part 1. University Press, Cambridge. pp. 192–239.

Dietrich OM, Giboda TS, Beer SA 1992. Comprehensive morphology of eggs of the halochilnae (Trematoda; heterophidae). Falia parasitology. *MCPD Publ*., 39:123–132.

Ekpenyong E 2008. Prevalence of intestinal helminths infections among schooling children in Tropical Semi Urban Communities. *Anim Res Int*., 5: 804–810.

Ekpo UF, Odoemene SN, Mafiana CF, Sam-Wobo SO. 2008. Helminthiasis and hygiene conditions of schools in Ikenne, Ogun State, Nigeria. *PLoS Negl Trop Dis*., 2 Suppl 1:e146.

Eneanya CI, Njom VS 2003. Geohelminth contamination of some common fruits and vegetable in Enugu, South east Nigeria. The Niger. *J. Parasitol*., 24:123–128.

Etimi, S.T and Akpan, P.A 1999. Studies on geophagy as risk factors for geoheliminthiases in Calabar, Cross River, Nigerian. *Nigeria Journal of Parasitol.,* 20: 91-98

Fashuyi, S.A. 1983. The prevalence of helminth egg in human faeces deposited on the streets of Lagos. *West African Medical Journal,* 2:135-138.

Gundiri, M.A and Okwuosa, V.N. 2005. Prevalence of Urinary and Intestinal parasites in Kwampe, Langtang North, Nigerian. *Nig. Journal of Parasitology,* vol. 26: pp 19-22.

Nyarango RM, Aloo PA, Kabiru EW, Nyanchongi BO (2008): The risk of pathogenic intestinal parasite infections in Kisii Municipality, Kenya. *BMC Public Health*, 8:237.

Obiamiwe, B.A, Nmorsi, P. 1990. Human Gastro Intestinal in Bendel State Nigeria, *Angew* 132:177-183.

Obiukwu, M.O; Umeanaeta, P.U; Eneanga, C.I and Nwaorgu, G.O. 2008. Prevalence of gastro-intestinal helminths in school children in Mbaukwu, Anambra State, Nigeria. *The Nigerian Journal of Parasitology*, Vol. 29: 15-19.

Ogbuagu, C.N; Eneanya, C.I; Chukwuma, C; Ogbuafu, E.N; Oguoma, V.M. 2010. High prevalence of intestinal parasites in a Nigerian Tertiary Health Institution. *The Internet Journal of Parasitic Diseases*, vol. 4: 2

Phiri K, Whitty CJ, Graham SM, Ssembatya–Lule G. 2000. Urban/rural differences in prevalence and risk factor for intestinal helminth infection in southern Malawi. *Ann Trop Med Parasitol*., 94:381-7.

Pukuma, S.M and Sale, M. 2006. Prevalence of gastro-intestinal helminth infections among children of Vunoklang primary school in Moderei ward of Girei Local Government of Nigeria of Adamawa State, Nigeria. *The Nigerian Journal of Parasitology,* Vol. 27, pp 73-75.

Sam- Wobo, S.O; Mafiana, C.F; Agwuegbo, S; Adebanji, A.O; Agbeyangi, O and Idowu, O.A 2008. Incidence of Ascaris infection among primary school children in Ogun State, Nigeria: A generalized linear model approach. T*he Nigerian Journal of Parasitology*, vol. 29(1) pp. 32-37.

Shitta, K.B; Akogun, O.B 2004. The prevalence of Intestinal parasite infection among the Nomadic Fulani in Adamawa State, *Nig. Journal of Parasitology*, Abstract 26.

Ugbomoiko, U.S; Onajole, A.T and Edungbola, L.D 2006. Prevalence and intensity of geohelminths infection in Oba-Ile Community of Osun State, Nigeria. *Nig. Journal of Parasitol.,* Vol. 27, pp 62-67

Ukoli, F. M.A. 1990. *Introduction to Parasitology in Tropical Africa.* Textflow Limited Ibadan, Nigeria.

Wang LD, Guo JG, Wu XH, Chen HG, Wang TP, Zhu SP, Zhang ZH, Steinmann P, Yang GJ, Wang SP et al. 2009. China's new strategy to block Schistosoma japonicum transmission. Experiences and impact beyond Schistosomiasis. *Trop Med Int Health, 14: 1475-1483.*

WHO 2010. Soil-transmitted helminthiasis. Number of children treated 2007–2008: update on the 2010 global target. *Wkly Epidemiol Rec*., 85: 141–8.

WHO Technical Report series 749: Prevention and Control of Intestinal Parasite infections: Geneva WHO; 1987.

World Health Organization 2013. Intestinal parasite: Burden and trends. https://apps.who.int/ctd/intpara/burdens.htm

****