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COMPARATIVE STUDIES OF INTESTINAL PARASITIC INFECTIONS BETWEEN RIVERINE AND UPLAND COMMUNITIES IN RIVERS STATE, NIGERIA.

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ABSTRACT

The study compared the prevalence of intestinal parasitic infections among some Riverine communities with Upland communities in Rivers state, Nigeria. Three local government areas (LGAs) were randomly selected from both riverine and upland communities respectively and three communities were further selected from each of the LGAs where samples were collected. Sample size was calculated and a total of 1869 samples were collected and analyzed using wet saline/iodine and formol-ether concentration methods according to parasitological standards. One thousand and fifty nine samples were collected from upland communities while 810 samples were collected from riverine communities. Of these samples, 306(28.9%) were positive in the upland communities while 110 (13.6%) were positive in riverine communities. The difference between the prevalence in the upland and riverine communities was statistically significant (P<0.001).Parasites identified in the study include Ascaris lumbricoides (56.6%), hookworms (19.0), Trichuris trichiura (10.8%), Srongyloides stercoralis (2.9%) and Teania sp (1.8%). Despite the perceived lower standard of sanitation in the riverine communities, the prevalence of intestinal parasitic infections was significantly lower than the upland communities.

Key words: Intestinal parasitic infections, Prevalence, upland, Riverine, Rivers State, Nigeria.

INTRODUCTION

Intestinal parasites are parasites that populate the gastro-intestinal tract in humans and other animals. They are associated with ignorance, poverty, malnutrition and squalor (Kang *et al.*, 1998), and constitute a major public health problem. Infections by intestinal parasites are wide spread throughout the world. Children are particularly susceptible and typically have the largest number of parasites. The numbers of parasites build up through repeated infections (Diagnoseme, 2011)

Renewed commitment to global parasite control has created an impetus to attain comprehensive data on infection distribution and intensity. In sub-saharan African, Nigeria has the highest prevalence of intestinal parasitic infection (Hotez,2009).

The estimated burden of the major helminthes shows that 55 million Nigerians have Ascariasis, 38 million are suffering from hookworm infection, 34 million have Trichuriasis and 29 million estimated cases of Schistosomiasis (Hotez, 2009). Several factors such as climatic conditions, poor sanitation, unsafe drinking water, and lack of toilet facilities are the main contributors to the high prevalence of intestinal parasites in the tropical and sub-tropical countries (Mahfouz *et al.*, 1997).

In Rivers State, intestinal parasitic infection has been shown to have high prevalence especially in children due to their vulnerability. Awi-waadu (2005) reported 84.6%, Abah and Arene (2006) reported 42.7%, Odu *et a*l., 2011, 30.7% and 27.6% was reported by Abah and Arene (2015). However, because the prevalence of intestinal parasitic infections varies considerably from place to place in relation to the pattern of transmission of the disease (Luka *et al.*, 2000), the need to compare this variation between upland and Riverine spurred the present work. There the aim of this study was to compare the prevalence between the riverine and upland communities of Rivers State, Nigeria.

MATERIALS AND METHODS

Study Area

Rivers State lies on the recent coastal plain of the eastern Niger Delta. It has much surface water and high rainfall of between 3420mm and 7300mm. the land surface can be grouped into three main divisions: the fresh water, the mangrove swamp and the coastal sand ridges zone. The state is about 20m above sea level. Fourteen of the 23 LGAs of the State are located on the upland with varying heights between 13 to 45m above sea level and the other nine are riverine. The population is very unevenly distributed among LGAs, towns and villages. The urbanization in the state is low and only 19 out of 1,079 settlements in the state have population above 20, 000 (PS, 2003).

Riverine communities exhibit linear, cluster and compact settlement patterns. Houses are located along the roads and streets within the community. Houses by the water front are so compact that it is difficult for individuals to build personal latrines for lack of space. With this kind of settlement pattern, outbreaks of diseases can be difficult to contend with. The sanitation and hygiene situations are lower in the riverine communities than other parts of the country due to the very difficult terrain, especially a very shallow water table, prevalent in the region. Most of the inhabitants defecate in the water which also serves as sources of drinking water and other domestic purposes

Sample size

The sample size was calculated using the single proportion population formula. It was calculated based on a prevalence of 83% with a margin of error of 0.05 and a confidence level of 95%. The design effect was calculated by taking the intraclass correlation for the statistic (i.e.1%) in parasitic infection in upland and riverine.The sample size was calculated using the formula by Daniel (1999) and modified by Naing *et al* (2006). A total of 1869 samples were examined.

Sample collection

In both the Upland and Riverine areas, three LGAs were randomly selected and three primary schools were further selected from each of the three local government areas, making the study sites nine each in upland and riverine areas respectively. Permission for the study was sought and obtained from the Rivers State Ministry of Health as well as the heads of the primary schools. The class teachers helped in the distribution of sample bottles to the pupils serially according to their names in the class register. The pupils were instructed on how

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to collect the samples (i.e., put a small portion of early morning stool sample in the bottle using the spatula attached to the sample bottle and bring it to school). The samples were collected and processed on the same day. Samples that were not to be processed on the same day were preserved in the refrigerator.

The samples were examined using the direct wet mount microscopic examination and the formol-ether concentration technique as described by WHO, (1991) and Cheesbrough, (1999.).

Local Gov't Area (LGA)	Name of School	Latitude	Longitude
Ikwerre (upland)	State School 1 Aluu	N 04^o 56' 00.2"	E 006^o 56' 36.3"
	State School II Isiokpo	N 04^o 58' 34.7"	E 006^o 52' 42.0"
	St. Martins State School Omagwa	N 04^o 58' 47.1"	E006^o 54' 54.6"
Emuoha (upland)	State School 1 Emuoha	N 04^o 52' 41.3"	E 006^o 51' 38.6"
	State School II Rumuji	N 04^o 56' 18.6"	E006^o 47' 09.4"
	State School Evekwu	N 04^o 55' 21.5"	E006^o 49' 09.14.9"
Khana (upland)	Primary School IV Bori	N 04^o 40' 31.9"	E 007^o 21' 50.9"
	Com. Primary school 1 Bean city	N 04^o 37' 40.0"	E 007^o 27' 25.5"
	Com. Primary school 1 Wiiyaakara	N 04^o 39' 43.4"	E 007^o 25' 36.1"
Degema (Riverine)	Bishop Crowder sch. 1	N 04^o 44' 05.0"	E 006^o 46' 13. 7"
	New church school Okudike	N 04^o 45' 12.0"	E 006^o 45' 59.8"
Akuku-Toru (Riverine)	State School Abonnema	N 04^o 43' 30.0"	E 006^o 46' 27.4"
	State School Abalama	N 04^o 46' 05.8"	E 006^o 50' 12.0"
Asari- Toru (Riverine)	St Michael school Buguma	N 04^o 44' 12.4"	E 006^o 51' 45.9"
	Primary School Ido	N 04^o 44' 35.8"	E 006^o 31'01.1"

RESULTS

The result of stool examination showed that out of the total of1869 samples examined in both upland and riverine areas of Rivers State, 416(22.26%) were positive for various intestinal parasites. Of the1059 samples examined in the upland, 306(28.9%) were found to be positive having single or multiple infectionsand of the 810 samples examined in the riverine communities, 110 (13.6%) were positive (Fig.1). In the upland area, 536 were males and 583 were females out of the total of 1059 while in the riverine area, 385 were males and 425 were females out of the total population of 810 (Table1). Results of prevalence of intestinal parasite infections in both the upland and riverine areas showed that Akuku toru local government areas had higher infections than the other two in the riverine areas (Fig.2).while Emuoha local government areas had higher infection than the other two local government areas in the uplandareas (Fig.3).These differences were not significant.The prevalence in the upland was higher than the riverine area.There is significant difference between rate of

infection in the upland area and riverine area ($p<0.001$).Sex related prevalence also showed that both male and female in the upland areas had higher infections when compared to their counterparts from the riverine areas(Fig.4).The sex related difference was significantly different between upland and riverine ($p<0.01$) but was not significant within the same location.

Parasites identified in the study were *Ascaris lumbricoides* (55.6%), hookworms (19.0%), *Trichuris trichiura* (10.8%),*Strongliodes stercoralis* (2.9%) and the other 11.68% were multiple infections in the upland area while in the riverine areas*Ascaris lumbricoides* (43.6%), Hookworm (20.9%), *Trichuris trichiura* (17.3%), *Strongyliodes stercoralis* (6.4%) *Teania*sp(1.8%) and the other 9.9% were for multiple infections (Table 2 and Table 3). In the upland areas,out of the 306 positive cases, 270 (88.2%)were single infections, 28(9.2%) double infections and 8(2.6%) mix infection of up to three parasites while in the riverine areas, out of the 110positive cases, 99(90.0%) were single infections, 7(6.4%) were double infections and 4(3.6%) mix infections of up to three parasites. In both upland and riverine, the combination of *Ascaris lumbricoides* and *Trichuris trichiura* had the highest frequency.

Table 1: Overall and sex-related prevalence in study area.

Study area	total examined	Total +ve	Total male	total female	total male+ve	total female+ve
Upland	1059	306	523	536	170	136
Riverine	810	110	385	425	61	49

Table 2: Prevalence of identified parasites in the study area.

Parasites	Upland (N=1059)	Riverine (N=810)
Ascaris lumbricoides	170(55.6%)	48(43.6%
Hookworm	58(19.0%)	23(20.9%)
Trichuris trichiura	33(10.8%)	19(17.3%)
Strongyloides stercoralis	9(2.9%)	7(6.4%)
Teania sp	0	2(1.8)

Table3: Prevalence of multiple infections of intestinal parasitic infections in the study area.

parasite combinations	Upland(N=1059)	Riverine(N=810)
As+Tt	12(3.9%)	5(4.5%)
As +Hw	12(3.9%)	2(1.8%)
As + Ss	1(0.3%)	0
As +Hw +Tt	8(2.6%)	4(3.6%)

key: As=Ascaris lumbricoides, Tt= Trichuris trichiura, Hw= hookworm, Ss=Strongyoides stercoralis.

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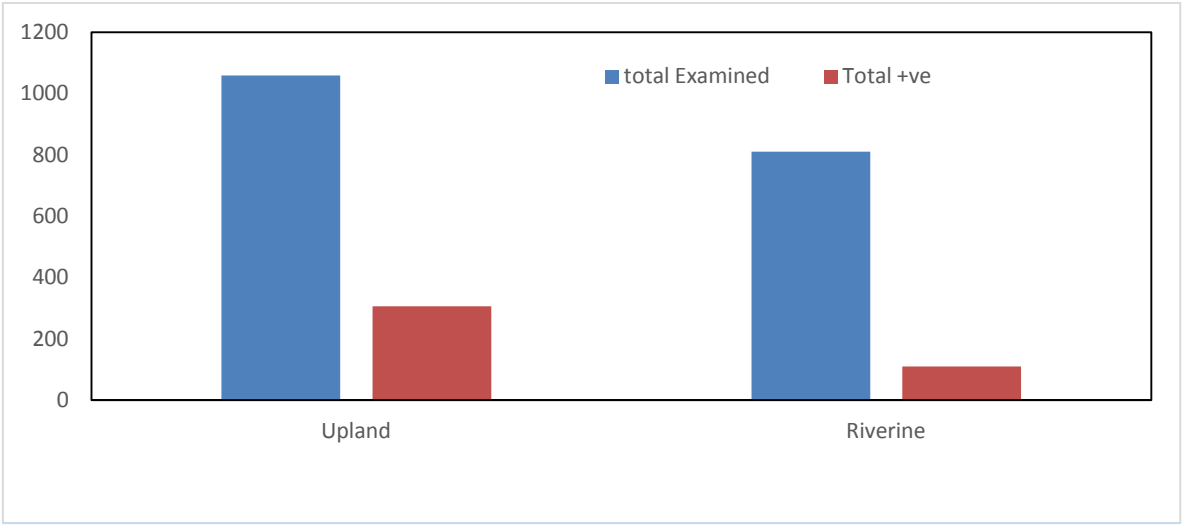

Fig1: Prevalence of intestinal parasitic infections in the study area.

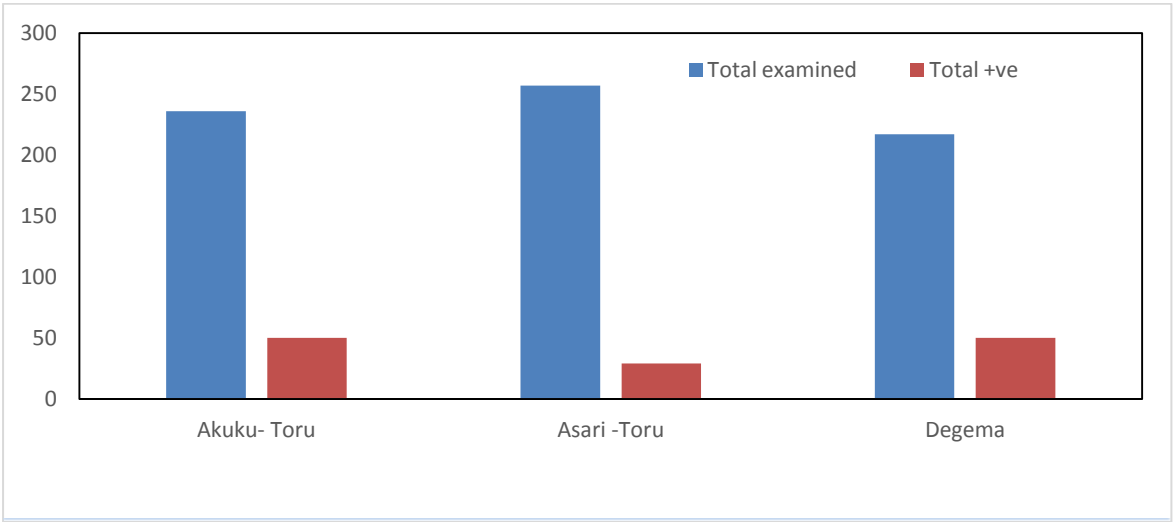

Fig 2: Prevalence of intestinal parasitic infections in the Riverine area of Rivers State.

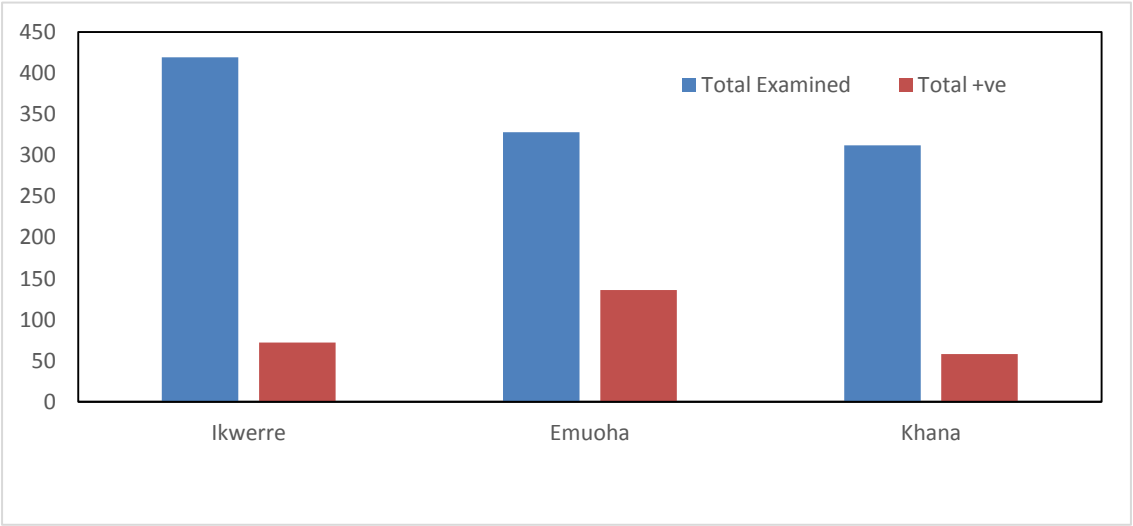

Figure 3: Prevalence of intestinal parasitic infections in the Upland area of Rivers State

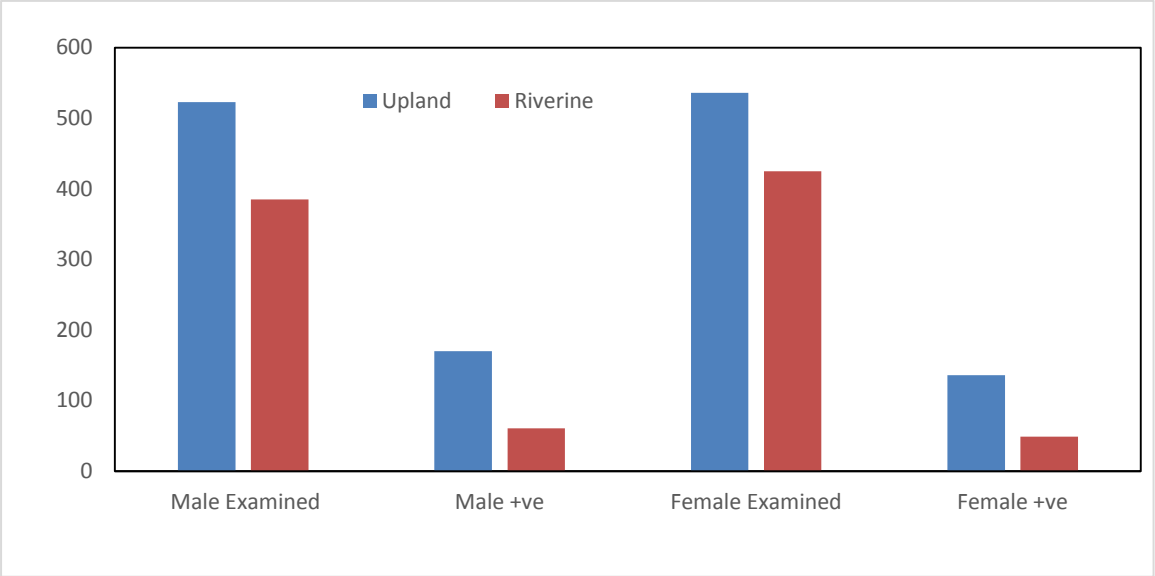

Figure 4: Sex related prevalence of intestinal parasitic infections in the study area.

DISCUSSION

Acquiring epidemiological information on the prevalence of intestinal parasitic infections in different localities is a necessary requirement that would enhance the development of appropriate control strategies. In view of the above, present study was designed to assess the prevalence of intestinal parasitic infections in the upland and riverine areas of Rivers State, Nigeria.The result of the study showed an overall prevalence of 22.26%. The prevalence rate is relatively high and agrees with similar studies done earlier in other parts of Nigeria(Obiukwu *et al.,* 2008; Akinboye *et al.,* 2015) and Rivers State (Awi-waadu,2005; Abah and Arene, 2006;2015; Odu *et al*., 2011;2015). These confirm the endemicity of the parasite in Nigeria as a tropical country. This high rate may be majorly as a result of the climatic conditions and level of sanitation in the area as poor environmental sanitation and climatic conditions (hot,wet and humid) favour the persistence of intestinal parasitic ova in the soil. This finding is consistent with Crompton, (1999)who observed that intestinal parasites are pervasive and thrive in communities in need of better housing, sanitation, water supplies, health, education and personal earnings.

The prevalence of intestinal parasitic infections observed in the present study was slightly high but showed a steady reduction when compared with previous studies that reported 84.6%(Aw-waadu, 2005) 42.7% (Abah and Arene, 2006), 30.7% (Odu *et al.,* 2011), and 27.6%(Abah and Arene, 2015).We had earlier observed that the reduction may be as a result of current effort of the Rivers State government to reduce infant mortality and improve environmental sanitation through the renewed enforcement of the monthly sanitation policy, massive construction of modern primary schools in all communities of the state, primary schools deworming and feeding programmes and health education (Abah and Arene, 2015).The steady reduction observed in this study is commendable and needs to be sustained as total elimination of these parasites is an achievable target.

The prevalence rate of the intestinal parasitic infections in the upland (28.9%) was significantly higher than the riverine areas (13.6%). This variation may be as a

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result of defecation into the Rivers by the riverine communities which eventually is washed into the oceanand so does not seed in soil where part of their developmental stages occur;*Trichuris trichiura* and *Ascaris lumbricoides* infections would occur through feces-contaminated soil and can survive in warm moist soil for longtime.*Strongyloides stercoralis* and hookworm penetrates the unbroken skin from contaminated soil.

Parasites identified in the study in both upland and riverine show similar pattern of frequency of occurrence with *Ascaris lumbricoides* being highest in both areas. This trend had been reported by previous works(Awi- waadu, 2005; Abah and Arene, 2006;2015 and Odu *et al.,* 2011;2013).The reason for this may be as a result of the pupils opting to go to the nearby bush to defecate due largely to the fact that the pit toilets are often soiled. The prevalence of hookworm was slightly high. This is particularly worrisome since hookworm can be effectively prevented by the use of footwear to protect the skin from the penetration of larvae lying in soil. However shoes are luxury in poorer rural society and certain tradition and religious groups encourage people dancing and moving around for worship barefooted. That may explain the reason for the high prevalence. It is of public health importance since it has been incriminated in cognitive damage and high anaemia and intestinal inflammation in children.

The prevalence of Teania sp was low. The finding is consistent with previous studies(obiukwu *et al.,* 2008; Abah and Arene, 2015; Awi-waadu, 2005). The low prevalence may be attributed to traditional feeding habit of the people who would prefer fish and sea food to beef and roasted beef, a delicacy generally referred to as "Suya".

The multiple infection observed in the present study showed that the combination of *Ascaris lumbricoides* and *Trichuris trichiura* was higher in both Upland and riverine areas, followed by hookworm and *Ascaris lumbriciodes* and triad of *Ascaris lumbriciodes*, Hookworm and *Trichuris trichiura*. This observation is a common feature of prevalence of intestinal parasitic infections throughout many parts of Nigeria as reported by other studies(Awi-waadu 2005;Akinboye *et a*l., 2015; Obiukwu *et al.*, 2008) and generally in the tropics (Kang *et a*l., 1998).

The study has been able to assess the prevalence of intestinal parasitic infections in upland and riverine areas of Rivers State Nigeria. This would facilitate the appropriate application of available scare resources to their control.The major obstacle to the implementation of cost-effective control is the lack of accurate descriptions of the geographical distribution of infection. This study was an attempt to describe the distribution of intestinal parasitic infections on bases of upland and riverine settlements of Rivers State. The effects of these parasites in children are significant and hence of public health concern. There is need to harmonize all efforts and control measures to achieve the desired goal of elimination of these parasites from Rivers State and Nigeria.

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