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The Prevalence of *Trichuris trichiura* Infection among Primary School Pupils in Dantube, Dawakin-Kudu Local Government Area, Kano State, Nigeria

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Abstract
The prevalence of whipworm infection (*Trichuris trichiura*) among primary school pupils in Dantube, Dawakin kudu local government Area of Kano State, between August, 2015 to January, 2016 was studied. Of the 400 samples collected and examined 101 (34.83%) were positive for single or multiple infections. The prevalence of the infection was significantly higher among males (75.25%, p-value 0.138) than females (24.75%, p-value 0.156) ($p < 0.05$). Children in the age group 4 – 6years had highest prevalence (43.66%) of whipworm infection and those between the ages of 13 – 15 years had (6.25%) the least infection. Those children who defecate in the bush were more likely to be infected than those who use modern toilet facility (R = 0.6). Analysis of the responses from the questionnaire shows that parents occupation, civil servant (odd ratio = 4.381) and business (odd ratio = 3.147) has a strong relationship between prevalence of the disease and the risk factor in the research area. Walking bare footed (odd ratio = 2.142) especially in areas where the soil is damp and moist throughout the year exposes the subject to infection. Hand washing activities (odd ratio = 3.71) have statistical significant effect on the prevalence of the infection. Personal hygiene, public health enlightenment programme should be encouraged particularly among school age children in the research area.
Keywords– Whipworm, prevalence, school age children, Dantube in Dawakin kudu

INTRODUCTION

Whipworm(*Trichuris trichiura*) is the third most common roundworms in humans and one of the most important soil- transmitted helminth with a wide geographic distribution, especially in tropical and subtropical regions where public sanitation and living conditions are substandard (World Bank, 2013). It has been estimated that 604-795 million people are infected globally with *Trichuris trichiura* and more than three billion people are at risk of infection (WHO, 2012). The highest prevalence of *trichuriasis* has been confined to Central Africa, Southern India, and Southeast Asia. Infections in children in some endemic areas may surpass 90% (Montresor *et al*., 1998; WSP, 2012). Although the majority of infected individuals remain asymptomatic, a significant number of *trichuriasis* patients, especially children with longstanding massive infections, have dysenteric syndrome presenting with chronic mucous diarrhea, rectal prolapse, anemia and iron deficiency, clubbing of fingers, protein-energy malnutrition, and growth retardation (Robertson *et al*., 1992). More importantly, deficits in cognitive function and stunting have been observed in childhood trichuriasis, hindering educational achievement and psychomotor development (Montresor *et al*., 1998; Saldiva *et al*., 2010).

The organism looks like a whip with a thin posterior end and a long thin anterior end. *Trichuriasis* is a tropical disease of children of age 5-15 years. It is prevalent in developing countries with poor sanitation, mostly developing countries (WHA, 2001). Ingested eggs initiate the infection. Eggs hatched into the duodenum where the larva invade and mature in the mucosa before migrating in the large intestine. The evidence of infection is the microscopic identification of whip worm eggs in feces (Saldiva e*t al*., 2010). It requires no treatment for asymptomatic or light infection. Mebendazole is used for more severe infections (WHO,2010; World Bank, 2013). If the infection is only with a few worms, there are often no symptoms. In those who are infected with many worms, there may be abdominal pain, tiredness and diarrhea (WSP, 2012)

Intestinal parasitism caused by *Trichuris trichiura* can be a major public health problem in the area. School children carry the heaviest burden of the associated morbidity due to dirty habit of playing or handling of infected soils, eating with dirty hands, unhygienic toilet practices and eating of contaminated food or water. The objective of the study is to elucidate the prevalence of whipworm infections among school children in the study area and relate the prevalence with sex and age of the children as well as determine the risk factors of the infection among the children with infections. The study is aimed also to provide useful information on Whipworm infection among primary school children in Dantube village of Dawakin-kudu distinct of Kano State. The study will also help in making appropriate intervention program and as well enables decision makers to institute possible preventive measures in the village. Moreover, the data obtained will serve as firsthand information useful for further research in the area.

Materials and Methodology

Study area and population

Dantube village is 15 kilometer from Kano town along Dawakin kudu by Zaria road, it is a prominent town under Dawakin kudu Local Government Kano state. The inhabitant of Dantube are Hausa and are mostly Farmers. Seasonal and Irrigation farming are widely practiced. In the 2006 population Census, Dantube was marked with a number of 11, 453 inhabitants. The geographical location of Dantube is 11º 50' 4" N 8º 35' 53" E, mean temperature ranges from 22ºC to 29ºC during the rainy season and 30ºC to 37°C during the dry season. Rainfall is bimodal with the short rains between April to June and heavy rainfall between July and September. Mean annual rainfall ranges from 700mm to 1000mm. Dawakin kudu LGA has a population of 416,113 people of which 202,077 (48.6%) are males (NPC, 2006).

Study design and sampling methods

The study was conducted between August, 2015 to January, 2016 during which 400 children were examined with permission from the primary health department of Dawakin-kudu Local Government and Local Education Authority.

Selection of schools and children

A random sampling method was used to select the primary schools. The schools selected were namely Dantube Primary School, Tamburawa Special Primary School, Fagi Nomadic Primary School and Tudun Bayero Primary School. In each primary school, all children in primary one and Early Child Care (ECC) classes between the ages 4 – 15 years were randomly selected. Proportion formula at 95% confidence interval (CI) level (Z = 1.96), 5% marginal error and an expected prevalence of 50% is considered because it is the first research of its kind in the area. Thus, the sample size was calculated using:$n = Z^2P(1-p)/d^2$(Garcia, 1999; 2001a). Hence, total of 400 stool samples were collected and 100 in each of the four selected schools.

Collection and examination of stool samples

Fecal samples were collected from 400 school-age children, 6 to 15 years old. From each school, 100 school children participated in the study. The samples were collected in a

plastic container and each plastic container The containers were immediately transported to Biology Laboratory of F. C. E. (T) Bichi for examination. Sample collected from each child was labelled with each child's identification number. Formol-ether concentration technique was used to screen samples. Each specimen was first examined macroscopically and its consistency or nature was recorded in accordance with the description by Estevez and Levine (1985), Smith and Schad (1990) and NCCLS (1997). The procedures were carried out in accordance with standard protocols as described by Katz *et al*., (1972), Garcia (2001a; 2001b) and (WHO, 2011).

Statistical Analysis

A questionnaires was administered to each of the selected pupils to obtain information from them on the following: Class, age, sex, whether hands are washed after using toilet, whether fruits and vegetables are washed before eating, source of drinking water, water contact activities parent's occupation and possession of pets at home as well as method of waste disposal. The data obtained in the study was presented in tables and containing 10ml of 10% formaldehyde. percentages and analyzed with respect to age, sex, class, sanitation habits, types of toilet system used, source of drinking water, and contact with water bodies. Odds ratio was used to find for the association between prevalence and the variables contained in the questionnaire. Chi-square was also used to determine the association among different schools by sex as well as age.

RESULTS

Prevalence of *Trichuris trichiura*

Infections per School

Out of the four (4) selected primary schools studied and one hundred (100) pupils examined in each of the school, prevalence per schools shows that Tamburawa Central Primary School had the least *Trichuris trichiura* infection with 02 (1.98%). The highest prevalence of 52 (51.48%) was recorded in Fagi Nomadic Primary School and 33 (32.67%) in Dantube Primary School. However, most of the children examined (34.83%) had a single infection while only 9.90% had a mix infection. (Table 1).

Table 1: Prevalence of *Trichuris trichura* Infection by Schools pupils in Dantube, Dawakin kudu Local Government of Kano State

School Name	Number Examined	Number Infected No (%)	Mixed Infection No (%)
Dantube Primary School	100	33 (32.67)	0 (0.0)
Tamburawa Central Primary Sch.	100	02 (1.98)	0 (0.0)
Fagi Nomadic Primary School	100	52 (51.48)	7 (6.93)
TudunBayero Primary School	100	14 (13.86)	3 (2.97)
Total	400	101 (25.25)	10 (9.90)
$\chi 2$		36.641	17.992
p-value		< 0.003	0.004

Prevalence of *T. trichuira* Infection according to gender

The Sex – specific rate for males (75.25%) was generally higher than for females (24.75%). However, there was no statistically significant difference in the prevalence of infection between the sexes ($p>0.05$). (Table 2).

Table 2. Sex – Specific Rates of *Trichuris trichiura* Infections among Primary School Children in Dantube, Dawakin-Kudu Local Government Area, Kano State (N=400)

Sex	Number Examined No. (%)	Number Infected No. (%)	X^2 No. (%)	p-value No. (%)
Male	284 (71.0)	76 (75.25)	1.846	0.138
Female	116 (29.0)	25 (24.75)	1.634	0.156
Total	400	101 (34.83)	3.480	0.284

Prevalence of *Trichuris trichiura* Infection by age

The prevalence of parasite by age showed that the highest prevalence (43.66%) was recorded in children between 4 – 6 years of age and the least prevalence (6.25%) was recorded between 13 – 15 years age group.

Table 3: Age – Specific Rates of *Trichuris trichura* infections among Primary School Children in Dantube, Dawakin-Kudu Local Government of Kano State

Age group (No. Examined)	Number Infected (%)
4-6 years (n=142)	62 (43.66)
7-9 years (n=112)	14 (12.50)
10-12 years (n=82)	21 (25.61)
13-15 years (n=64)	04 (6.25)
Total	**101 (25.25)**

Effects of Some Factors on the Prevalence of *Trichuris trichiura* Infections

Responses of the pupils to the questionnaires with reference to every single factor were summarized in Table 4. Statistical analysis to show associations between one factor with another using odd ratio (OR) of greater than one to indicate weak or strong relationships between the factor and the prevalence of the disease were used. Source of water for house hold use did not have statistical significance effect on the prevalence of the infection when compared with Borehole (odd ratio = 0.21) and well water (odd ratio = 0.3). Water contact activities also indicate that there was no significant association between swimming (odd ratio = 0.045) and fishing (odd ratio = 0.155) with prevalence. With regards to the use of toilet when compared with stream as reference, the use of pit latrine (odd ratio = 1.521) and bush (odd ratio = 1.493) indicated that there was a significant association between the factor and seem not protective. Analysis of the responses from the questionnaire also shows that with regard to parents occupation, civil servant (odd ratio = 4.381) and business (odd ratio = 3.147) shows a strong relationship with the prevalence of the disease in the research area. Walking with bare foot (odd ratio = 2.142) especially in areas where the soil is dump and moist throughout the year exposed the subject to infection. Hand washing activities (odd ratio = 3.71) were found to have significant effect on the prevalence of the infection (Table 4).

Table 4: Effects of Some Factors on the Prevalence of *Trichuris trichiura* Infections in Dantube, Dawakin Kudu Local Government of Kano State

Factor	Number Infected	Number Uninfected	Odds Ratio Value	95% C. I.
Source of Water				
Stream [R]	21	11		0.131 -
Well	204	91	0.3	0.521
Bore-hole	36	105	0.21	0.134 - 0.325
Water contact activities				
i Swimming	142	52		0.031 -
Yes [R]	24	148	0.045	0.076
No				
ii Fishing	86	121		0.092 -
Yes [R]	24	219	0.155	0.261
No				
Hand washing				
Yes [R]	134	101		2.101 -
No	42	67	3.71	6.214
Walk with barefoot				
Always [R]	143	94		0.431 -
Occasionally	73	56	2.142	7.421
Not at all	8	11	0.671	0.536 - 1.183
Finger nail trimming				
Always [R]	96	124		1.114 -
Occasionally	142	152	1.672	2.521
Type of Latrine				
Stream [R]	64	73		0.371 -
Pit	126	72	1.721	0.814
Modern	3	6	0.462	0.261 -
Bush	143	81	1.793	5.831
				0.314 - 0.754
Occupation of Parent				
Farmer [R]	210	101		2.245 –4.210
Civil servant	63	86	4.381	2.821 –6.783
Business	16	32	3.147	

[R] = Reference variable

DISCUSSION

The findings of this study shows that an overall prevalence of *Trichuris trichiura* infection of 34.83% out of 400 samples collected and examined 101 were positive. Our findings revealed that Fagi Nomadic primary school which presented the highest prevalence (51.48%) of whipworm among the surveyed schools does not have toilet facilities. The pupils normally defecate in the nearby bush surrounding the school. This probably results in the eggs being washed into the school compound when it rains resulting in the environment of the school and surrounding area being highly contaminated with eggs of the parasites.

Most of the school children go to school barefooted leading to the high prevalence of whipworm infections. Dantube is still a virgin area whereby no study on whipworm has been done in the area. This further accounted for the high prevalence of the *Trichuris trichiura* egg/larvae in the stool samples and environment. Most of the pupils especially those from Fagi Nomadic primary schools and Tudun Bayero Primary School had mixed infection. Highest prevalence rate is similar to what has been reported by Auta *et al*., (2013) and Abdullahi and Abdulhazeez (2000). The high prevalence could be due to unhygienic habit of not washing hands before eating after playing in school and also due to their habit of picking and eating food like biscuits and sweets that had fallen on the ground as they play. This observation is in agreement with the study by Brooker *et al*., (2009).

The high incidence of whipworm infection (75.25%) in male is likely due to their habit of playing while going to school as well as hunting and fishing without foot wear. Similar observation had also been made by Auta *et al*., (2013) who reported higher prevalence of *Trichuris trichiura* (62.3%) in males and concluded that, the differences in the prevalence of helminthosis obtained between the males and females might be due to the exposure to water bodies and feeding habits. The prevalence of parasites by age showed that the highest prevalence (43.66%) was recorded in children between 4 – 6 years of age and the least prevalence was recorded (6.25%) between 13 – 15 years age group. Bethany *et al*., (2002) reported a prevalence of 81.6% and 52.4% among children aged 10-12 years and 13-15 years respectively. Whipworm infection was less prevalent among the older age group similar to the reports of Hotez and Daar (2009) and however, the decrease of the prevalence with age could be attributed to the fact that with increase in age the children are becoming more conscious of personal hygiene as well as development of resistance via increased immunity. The observation of the prevalence of helminth parasites with age is in conformity with the findings of Nokes and Bundy (1993) who reported that whipworm burden decreased as children moved to higher classes. In a related study by Nwosu (2010) a total of 978 pupils in Delta state were examined for whipworm infections, consisting of 516 (52.76%) males and 462 (47.24%) females. The study indicated that 907 of the 978 children were positive for one or more helminth infections therefore revealing a general prevalence of 92.74%. Its prevalence though, decreases with age, and pupils within the age 5-7 years had the highest prevalence (90.26%) while those in age group 11-13 years recorded the least (68.97%).

The Sex – specific rate for males was generally higher than for females (24.75%) in this study, however, there was no statistically significant difference in the prevalence of infection between the sexes ($p>0.05$). Previous study by Ivoke (2007) involving 420 primary school pupils of both sexes aged 6-14 years, which was conducted in 8 primary schools at different locations in Ishielu Local Government Area (L.G.A.) of Ebonyi State, Nigeria, the distributions of the infections were not gender-dependent, and between-sex prevalence was not statistically significant ($p > 005$).

Statistical analysis to show associations between one factor with another using odd ratio (OR) of greater than one to indicate weak or strong relationships between the factor and the prevalence of the disease were used in responses of the pupils to the questionnaires with reference to every single factor (Table 4). Source of water for house hold use did not have statistical significance effect on the prevalence of the infection when compared Borehole (odd ratio = 0.21) and well water (odd ratio = 0.3). Water contact activities also indicate that there was no statistical significant association between swimming (odd ratio = 0.045) fishing (odd ratio = 0.155). With regards to the use of toilet when compared with stream as reference, the use of pit latrine (odd ratio = 1.521) and bush (odd ratio = 1.493) indicated that there was a statistical significant association between the factor. Some cultural practices favour spread of infection.

The use of water for cleaning after defecation, and communal feeding from a common bowl in open street yard, a usual practice in some rural areas, may also account for a high prevalence of whipworm infection (Bundy, 2011). Meals are often exposed to the wind, insects and domestic animals which may contaminate food with helminth ova while participants in the communal dinner are awaited. Majority of the country is warm and moist for most of the year creating a good environment for the parasites to develop all year round (Abdullahi and Abdulhazeez, 2000).Analysis of the responses from the questionnaire also shows that parents occupation, civil servant (odd ratio = 4.381) and business (odd ratio = 3.147) shows a strong relationship between prevalence of the disease and risk factor in the research area. Low level of education and poor socio-economic status of parents has been associated with helminthic infection in children (WSP 2012; WHO, 2012). In Nigeria, helminth infections are still a disease of poverty, as there is a strong correlation between parental socioeconomic status and intestinal parasitosis in children. Auta *et al.* (2013), found a higher prevalence of helminthic infections in children whose parents are unemployed or are petty traders, compared to children of professionals and middle class workers. Walking with bare foot (odd ratio = 2.142) especially in areas where the soil is dump and moist throughout the year exposed the subject to infection. Hand washing activities (odd ratio = 3.71) have statistical significant effect on the prevalence of the infection. In this study it shows that the prevalence of pit latrine (odd ratio = 1.721) and children that did not use toilets but defeacate in bushes (odd ratio = 1.793) is almost the same.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

A total of 400 samples collected and examined and 101 (34.83%) were infected. The present investigation has shown that whipworm infection remains a public health problem in the study area. The presence of *Trichuris trichiura* infection among these primary schools children in this study area is as a result of poor environmental sanitation, low levels of living standards and ignorance of simple health promoting behavior.

Conclusion

Finding from this study reveals that *Trichuris trichiura* infection is common in Dantube, Dawakin kudu local government Kano State, Nigeria. This is a reflection of the poor state of hygiene and high rate of asymptomatic carriers in the community. The result of this study adds to the store of baseline data on the occurrence of whipworm infections among Pupils.

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Recommendations

- The findings from the study support the need for the establishment of a health programme for the control of the helminthes in the community. Cure alone is almost useless in stamping out *Trichiuriasis* in the study area, because the patient can easily acquire infections due to lack of sanitation. A systematic review and meta-analysis by World Health Assembly (2001), WHO, (2010) and WSP (2012) revealed that providing access to and promoting the use of sanitation facilities is an effective control measure.
- Creating education and communication strategies that provide prevention information that is specifically targeted at the community.
- The availability of improved sanitation together with chemotherapy and health education could lessen the problem of *Trichuris trichiura* infection in the study area. These measures would improve the quality of life, particularly for children.

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