

A Survey of Hookworm Infection among Pupils of School Age in Jos-North, Plateau State, Nigeria

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ABSTRACT: This study was conducted to determine the prevalence of Hookworm infection among children of school age in Jos-North Local Government Area of Plateau State. A total of 2,800 stool samples from pupils aged 3 – 15 years and above, attending seven (7) primary schools were collected and bio-assayed for Hookworm ova using direct smear and formalin – ether concentration techniques. Six hundred and forty seven (647) pupils (23.11%) were found to be infected by various parasites. Parasites encountered in order of occurrence include *Ascaris* (8.46%), *Entamoeba histolytica* (5.64%), Hookworm spp (5.14%), *Giardia* (2.61%) and *Trichuris* (1.29%). The result showed that 144 of the pupils had hookworm ova in their stool samples. This accounts for 5.14% of the total population and 22.26% of the infected population. There was no significant difference ($P > 0.05$) between males and females with respect to the prevalence of the infection, although more males (86) were found to be infected than females (58). There was significant difference between the different age groups ($P < 0.05$), 3 – 6 yrs having the highest infection rate (11.3%) while 15 yrs and above have the lowest (1.31%). The implications of the findings on the occurrence and distribution of Hookworm infection and possible control measures were highlighted. Further study is needed to identify which of the two Hookworm species is most prevalent.

Key words: Hookworms, Prevalence, Jos-North L. G. A., Pupils of School age.

INTRODUCTION

Hookworm infection is one of the most common diseases in Nigeria, infecting people at certain periods of lifetime with far reaching disabling and debilitating effects on the individual victims and on the socio-economic development of nations. The causative organisms of the common Hookworm infection are the strongylid nematodes *Necator americanus* and *Ancylostoma duodenale* (Udonsi, 1984).

WHO (1981) observed that the geographical distribution of the two main Hookworms, *N. americanus* and *A. duodenale*, used to be restricted and relatively distinct, the former being more prevalent in Europe and South Western Asia, and the latter in Tropical Africa and in the Americas. However, over the past decades, both parasites have become widely distributed throughout the tropics and rigid demarcations are no longer tenable.

In Nigeria the presumed human Hookworms, *N. americanus* and *A. duodenale*, both occur (Agbolade *et al.*, 2004; Odebunmi *et al.*,

2007). Onubogu (1978) and Nwosu (1981) observed that these two diseases (Ancylostomiasis and Necatoriasis) are associated with poor hygienic practices and improper disposal of human wastes. These features are typical of most rural and urban settlements in Nigeria where there is poor planning and inadequate public health facilities. Bundy *et al.* (1991) estimated that over 900 million people are infected with Hookworm disease worldwide.

Hookworm infection in Nigeria is markedly seasonal because of the influence of climate on the free-living larval stages of the parasites. Nwosu and Anya (1980), suggested that this factor could be of serious economic consequences if the period of heavy infection or high incidence, coincides with busy period in the agricultural communities in the country.

Surveys by various workers, in different parts of Nigeria, show a remarkably high rate in both the incidence and intensity of Hookworm disease in the indigenous

populations. Hookworm infection is endemic and highly prevalent among Nigerians living between latitudes 35° N and 30° S where the disposal of faeces is inadequate or where the environmental conditions such as humidity and temperature favour the development of the infective worm larvae (WHO, 1981).

Nwosu and Anya (1980) observed that the incidence and prevalence of Hookworm infection appear to be on the increase from year to year in most rural communities around Nsukka, Anambra State and this can be said to be true for the rest of the country given the poor sanitary and waste disposal condition in the urban and rural communities. Jos-North, which is an urban settlement with poor sanitary conditions, provides a conducive environment for Hookworm infection. It is thought germane therefore to re-assess the prevalence of the infection in such area. This study, on the prevalence of Hookworm infection among children of school age in Jos-North LGA, was designed to enable accurate statistical analysis and deductions to be made from results obtained in the various experiments performed.

MATERIALS AND METHODS

Study area: The study was carried out in Jos-North Local Government Area. Jos is situated in the Northern savannah vegetation belt. It lies on latitude 9.5° North and longitude 8.5° East. It has an average annual rainfall of 1,400mm (55.12inch) and the average number of rainfall days is 112 days. There is usually a sharp break between the rainy season which lasts from April or May to September or October and a dry season which lasts from November to March or April. The annual mean minimum temperature is 17.0°C while the maximum is 27.2°C.

Mining activities have led to the artificial creation of holes and crevices where water deposits giving rise to small pools and rivers. The study was carried out in seven (7) primary schools; Local Education Authority (LEA) primary school Tudun Wada, Local Education Authority Angwan Rogo, Islamiyya primary school Jos, Baptist primary school Nasarawa, LGED primary school Katako and ECWA primary school Gada Biyu. Each school is located in a different wing of the area. These subjects

were chosen using purposive sampling as described by Fox (1969).

LEA Tudun wada is situated at the North-East precipice in Jos-North local government area. The area is typical lower class with numerous pathways into the various homes. Small running streams and rivers which provide a suitable environment for the eggs and the infective third stage larvae, the area is also used by most of the inhabitants for recreational domestic purposes. Islamiya primary school is situated along Bauchi road in the central precipice of Jos-North. Baptist primary school Nasarawa is located in the left wing of the central zone. Jabalunoor is situated along Bauchi-Ring road in Dogon dutse. It is a new international school with water system toilets and children from well-to-do parents. LGED primary school Katako is one of the oldest schools in Jos-North and is situated near Laranto Jos. ECWA School Gada Biyu, also one of the oldest schools is located in Gada Biyu near former Tati Hotel Jos.

Actual survey: A comprehensive study of Hookworm amongst a total of 2,800 primary school children was conducted between March 2008 and June 2009. Permission for the survey was obtained from the Primary Health Care Unit of the Local Government Area and from the various school heads.

Each day, before the distribution of the stool sample bottles, a brief health lecture was delivered to the school children about Hookworm infection and their debilitating effects with a view to encouraging active participation.

Parasitology: Daily, a batch of 25 clean bottles were shared among the school children, a bottle per child. During collection, the name, sex, age, weight, nutritional status, height etc of each child was recorded.

The fresh stool samples were carried to the Zoology Laboratory of the University of Jos, Nigeria and kept in the refrigerator for examination after few hours of collection. Samples that could not be examined on time were preserved in Bayer's solution, which was prepared by mixing 0.7g of Copper II chloride, 7ml of acetic acid and 100ml of 20% formalin.

Samples were examined using the direct smear (Iodine and saline preparation) and

formalin- ether concentration technique as described by Cheesbrough, (1998).

A total of 2,800 pupils aged between 3 and 15 years and above from different socio-economic backgrounds and nutritional status, were studied.

Statistical analysis: The overall data was separated according to sexes (males or females), age groups and according to schools.

The data was then presented in tables, graphs and pie charts forms, while student t – test and chi square test were used to determine the level significance or variation between

schools, sexes and age groupings. P values less than 0.05 were considered significant.

RESULTS

Out of a total of 2,800 stool samples were examined for Hookworm ova. Six hundred and forty seven (647) pupils (23.11%) were found to be infected by various parasites, of which Hookworm accounted for 22.26% of the infected population and 5.14% of the total population. The various parasites found were *Ascaris* (8.46%), *Entamoeba histolytica* (5.64%), *Giardia* (2.61%), Hookworm (5.14%) and *Trichuris* (1.29%). Table 1 shows the distribution of parasites among the pupils in the different primary schools.

Table1. Distribution of parasites among the different schools.

School	<i>Ascaris</i>	<i>Entamoeba histolytica</i>	<i>Giardia</i>	<i>Hookworm</i>	<i>Trichuris trichura</i>	Infected population
LEA T/Wada	34(8.5%)	10(2.5%)	1(0.3%)	45(11.3%)	6(1.5%)	96(24.0%)
LEA A/Rogo	38(9.5%)	44(11.0%)	10(2.5%)	37(9.3)	4(1.1%)	133(33.3%)
Islamiya Jos	21(5.2%)	15(3.8%)	8(0.19%)	11(2.8%)	5(1.3%)	60(15.0%)
Baptist Nasarawa	29(7.3%)	33(8.2%)	15(3.7%)	27(6.8%)	10(2.5%)	114(28.5%)
LGED Katako	27(6.7%)	21(5.3%)	13(3.2%)	13(3.3%)	6(1.5%)	80(20.0%)
Jabalunnoo r D/Dutse	14(3.5%)	1(0.25%)	7(1.8%)	3(0.8%)	-	25(6.35%)
ECWA G/Biyu	74(18.5%)	34(8.5%)	19(4.8%)	8(1.9%)	5(1.3%)	139(34.8%)
Total	237(8.46%)	158(5.64%)	73(2.61%)	144(5.14%)	36(1.29)	647(23.11%)

Figure 1 shows the distribution of Hookworm infection in the various schools sampled. Of the 144 pupils that had Hookworm, LEA T/Wada accounted for 45 (11.3%) which represents the highest rate of infection. This was followed by LEA A/Rogo 37(9.3%), Baptist 27(6.8%), LGED Katako 13(3.3%), Islamiya 11 (2.8%), ECWA 8 (1.9%) while Jabalunnor, having the least infection rate, recorded 3 (0.8%).

Figure 2 shows the prevalence of Hookworm by sex in the various schools sampled. From the 144 pupils found positive for Hookworm, 86 were males given an infection rate of 59.72% while 58 were females with an infection rate of 40.28%. This picture

therefore generally revealed a higher infection rate among the males compared to the females. Although males were more infected than females, statistical analysis showed no significant difference (P>0.05) between the two sexes in the intensity of infection.

Figure 3 shows the infection by age. Pupils within the age group of 3 – 6years recorded the highest infection rate (11.3%), followed by 7 – 10 age group (8.83) while 15 years and above recorded the least infection rate (1.31%). There is a significant difference in the prevalence of the infection between the different age groups P < 0.05, with younger

children having higher infection rates than elderly ones.

DISCUSSION

The evidence from this work showed a low prevalence of Hookworm infection among primary school pupils in this area. The low level of infection recorded in this study appeared to be lower than what was observed by Agbolade *et al.*, (2004) in Ogun, Amuga *et al.*, (2006) in Nassarawa who recorded higher infection rates of 16.6 and 28.8% respectively. The lower prevalence in this study may be attributed to the increased

awareness created by western education as regards the biology of the parasite and improved sanitary conditions. The difference may also be due to fewer numbers of pupils examined by previous researchers 199 and 418 respectively for Agbolade *et al.*, (2004) and Amuga *et al.*, (2006) and the methods of diagnosis employed in this study. But this low prevalence is in agreement with what has been recorded by Okpala (1961) and Akoh (1980) in the Northern part of this country, and that of Odebunmi *et al.*, (2007) from Vom in Jos-South LGA in Plateau State.

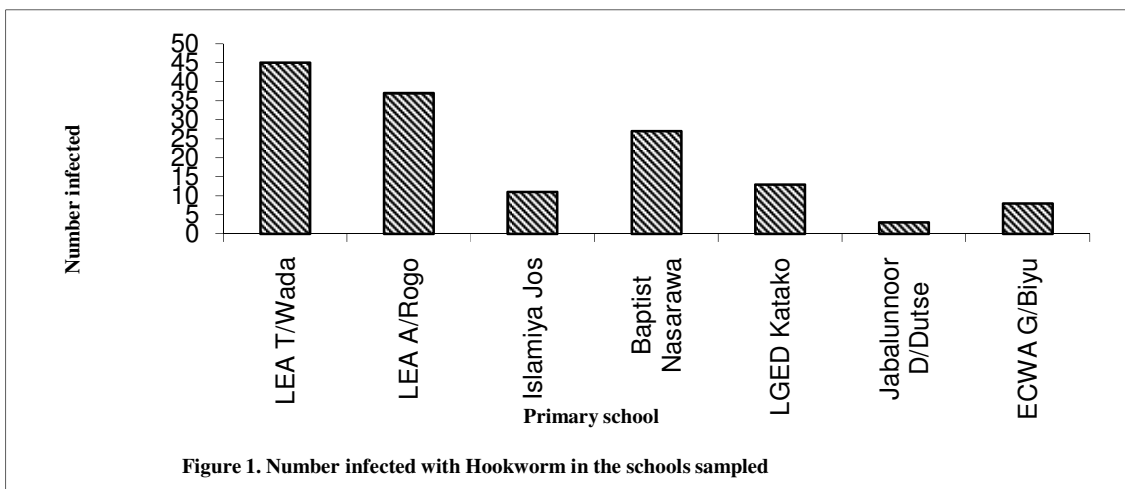


Figure 1. Number infected with Hookworm in the schools sampled

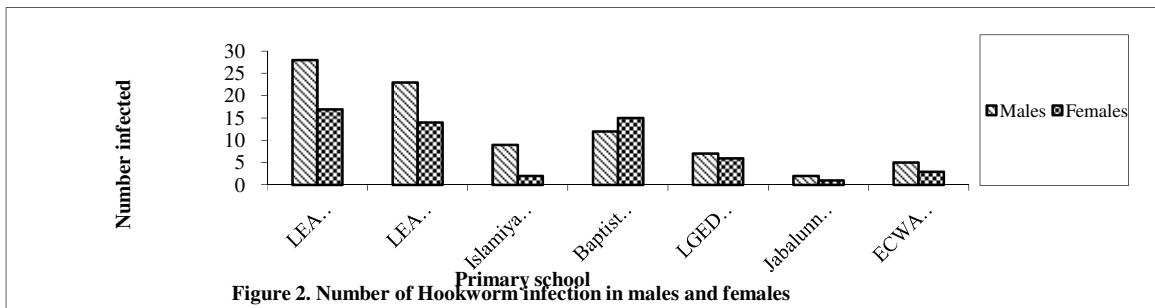


Figure 2. Number of Hookworm infection in males and females

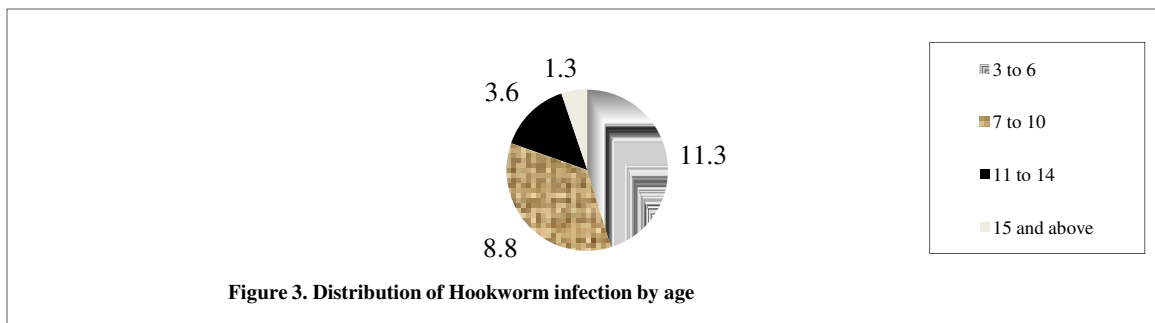


Figure 3. Distribution of Hookworm infection by age

There was a striking difference in the distribution of the infection within the different schools sampled. This could be attributed to the sanitary condition of the pupils and toilet facilities provided by the schools. Children from LEA T/Wada, LEA A/Rogo and Baptist schools recorded higher infection rates compared to children from Jabalunnor. Jabalunnor is a modern school and most of the children attending are children from well-to-do families who wear shoes all the time, undergo periodic medical examination and are better nourished. They also have better sanitary practices using flushed toilets. Children from the other schools do not only use pit latrines but medical, sanitary and nutritional attentions are minimal.

Infection was not significantly different between the two sexes, although males were more infected than females. This conforms to the work of Okpala (1957) who suggested that it might be due to the fact that oral infection is also important, especially for *Ancylostoma*. But this disagrees with the work of Odebunmi *et al.*, (2007) who reported a significant difference between males and females. The non-significant difference in the rate of infection between the two sexes, observed in this study, may be due to the position and customary division of labour between the sexes in the society. Also cultural and religious factors come into play here as males are given unrestricted freedom for play time thereby exposing them to the soil that harbours the third stage larva, while females are not given such liberties.

Results showed that the different ages were infected to varying degrees. The age distribution of Hookworm infection among the various age groups showed a significant association between age and infection with children between the age group 3-14 years having the highest prevalence. This could be due to the fact that younger children move about more frequently, playing in pools of water barefooted, while older ones wear shoes.

This disagrees with the works of Fawole and Arinola (1995) who showed that hookworm infection increases with age. However,

findings from this study agrees with the work of Ejezie (1981) in his study of faecal samples from 810 primary school children in Lagos state and found that ages between 6 and 9 years had the highest prevalence of Hookworm infection. It also agrees with Ugbomoiko and Ofoezie (2006) who reported the disease to be age-specific with peaks in the 11 – 15 age bracket. The high infection rate in children found in this study could be attributed to their adventurous way of life, which could expose them to the infective third stage larvae.

Conclusion: In the survey of seven (7) primary schools, 2,800 school children were examined. Six hundred and forty seven (647) pupils were found to be infected. Hookworm had an overall prevalence of 5.14% and also accounted for 22.26% of the infected population.

There was a difference in the infection between the various schools with the modern school being the least infected, 59.27% of the pupils with Hookworm were males and 40.28% females. There was a relatively higher infection rate in males than females although statistical analysis revealed no significant difference in infection rate between the sexes.

There was a significant variation in hookworm-infected pupils relative to age, with the younger children aged between 3 and 14 years having the highest infection rate. Hookworm infection is often associated with poverty and ignorance.

Recommendation: WHO (1987) reported that ignorance and lack of adequate hygiene contribute immensely to Hookworm transmission. Therefore, health education is a way for mobilizing the populace on the dangers associated with public and private insanitary conditions.

Indiscriminate stooling should be discouraged, provision of toilet facilities instead of bush defaecation helps in reducing the spread of the infection.

Generally, this work has shown that an average primary school pupil in this area (and probably elsewhere in the country) is harbouring parasitic infections, most of which are preventable through planned and carefully

organized health education programmes. A high prevalence of parasitic disease particularly among children is an index of not only their communities' low level of health, but also of inadequate health education. The school authorities have a tremendous role to play in order to change the situation. Studies are underway to differentiate the two Hookworm species.

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