Revalence and Determinant Factors of Hookworm Infection in Stool Samples of School Aged Children in Mangu Local Government Area of Plateau State, Nigeria.

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ABSTRACT

Hookworm infection is a common parasitic infection in tropical Africa. The prevalence of hookworm infection is affected by different determinant factors. This study aimed to determine the prevalence of hookworm infection and determinant factors among school aged children in Mangu Local Government Area of Plateau State, Nigeria.

A total of 684 stool samples were randomly collected from school children in Mangu L.G.A of Plateau State, and examined for hookworms, using Kato-katz technique. Risk factors and activities were monitored through the administration of a simple structured questionnaire. Out of 684 stool samples that were examined, 60(8.77%) were positive for hookworm parasite. The prevalence of hookworm infection was high among school aged children. Walking with bare foot, inadequate hand washing habit, and lack of proper latrine utilization are seen to be the major determinant factors for the high prevalence of hookworm infection. Hence, community mobilization, deworming of persons already infected and health education should be carried out in order to reduce hookworm infection among school age children in Mangu L.G.A of Plateau State, Nigeria.

KEY WORDS: Hookworms, prevalence, determinant factors, pupils, School Aged Children, Mangu, Plateau State, Nigeria.

I. INTRODUCTION

Hookworm infection is a public health problem and is more severe in resource poor countries, where there is poor hygiene, open defaecation, habit of walking with bare foot and scarcity of clean water which are the major determinants for prevalence of infection. Globally, more than 740 million people are infected with hookworm[4]. He also observed that hookworm infection is the leading cause of anaemia in Sub – Saharan Africa. Hookworm infection decreases the school performance of children by 20% [5].

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 [18].

Hookworm is one of the soil-transmitted helminth parasite, two species of hookworm are Necatoramericanusand Ancylostomaduodenale. The two species currently infect about 1.2 billion persons worldwide [2]. They occur in predictable areas where sanitary and environmental conditions favour the development of the infective filariform larvae. Hookworms feed by sucking blood from the capillaries of the small intestinal mucosa. It has been estimated that 2.1 billion persons are suffering from iron deficiency anaemia which is the secondary phase of hookworm infection [3]. Many of the affected population live in rural communities of developing countries where hookworm infections are endemic. Hookworm infection occurs both in adults and children, but is more common in children [5].

Hookworm parasite infection is one of the major members of geohelminthic infections which are common in developing countries. Although control programs are done, hookworm's disease burden remains high. Currently, hookworm affects

approximately 500 million people, With 5.1 billion at risk for acquiring infection worldwide and approximately, 198 million infected cases in sub-Saharan region. Hookworm infection is also the major causes of mortality and morbidity among the intestinal parasites in Nigeria.

The distribution of hookworm parasite differs from region to region in the country due to several environmental, social and geographical factors. School based studies in Nigeria indicated that the prevalence of hookworm is high among school aged children [7].

High prevalence of hookworm is mainly related to several determinant factors including poverty, poor living conditions, poor personal hygiene, lack of environmental sanitation, bare foot walking on exposed contaminated soils.

The disease burden is significantly high in developing countries. Infections by hookworm lead to malnutrition, iron deficiency anaemia, foetal stunted growth and increased vulnerability to other infections and low educational achievement in school children.

Children are at high risk of being infected by hookworm since they play on soil with their bare hands and walk with bare foot. This parasite affects the red blood cells (RBCs) in one way or the other and causes anaemia especially in children. For instance, hookworms consume RBCs and causes intestinal bleeding which is ideal for blood cell formation leading to anaemia. Children with anaemia as well as other parasitic infections are a number of times more likely to be stunted and underweight than those who do not. Therefore, this study aimed to determine the prevalence of hookworm infection and determinant factors among school aged children in Mangu L.G.A of plateau state, Nigeria.

II. MATERIALS AND METHODS
2.1 THE STUDY AREA
The Study was carried out in Mangu Local Government Area of Plateau State, in North Central Nigeria. The area lies within longitude 9°26'N and latitude 9°08'E. It covers a landmass of 1,653 square kilometers, with a projected population of 294,931, according to the Population Census of 2006. Mangu town, the headquarter of the Local Government lies 77 kilometers away from Jos. It has 11 districts, namely; Mangu, Gindiri, Langai, Kombun, Panyam, Pushit, Kerang, Ampang West, Mangun, Chakfem and Jipal. The area is inhabited by two major ethnic groups; the Mwaghavul and the Pyem people, with several other minority groups, like Mupun, Berom, Afizere, Bijim, Fulani, as well as Hausa settler groups. The inhabitants of the area are predominantly farmers, civil servants, traders and fishermen.

Mangu Local Government Area has a minimum temperature of 13°C and a maximum of 27°C.The area has an average rainfall of 580mm. The area has 2 main seasons; the dry and wet seasons. Dry season in the area commences from the month of November and ends in March, while wet season spans from April to October.

2.2 ETHICAL CLEARANCE
Prior to commencement of the study, an ethical clearance was obtained from Plateau State Ministry of Health headquarters, Jos and was submitted to the office of the Chairman, Mangu Local Government Area, and his permission was sought to carry out this research in his domain. The objectives of the research were discussed with the authority of the local government.

A letter of permission was also obtained from the Local Education Authority of Mangu Local Government Area to the different schools that were randomly selected for the study, and sought the consent of the school authorities and parents/guardian to use pupils/students as study sujects. The objectives of the study were also discussed with the school authorities, parents, staff and pupils.

2.3 SELECTION OF STUDY DISTRICTS AND SCHOOLS
Six out of the eleven districts in Mangu L.G.A were randomly selected. The selected districts include Ampang West, Kerang, Mangun, Mangu, Panyam and Gindiri. Eleven schools were also selected by a simple random sampling technique from the different communities.

2.4 SELECTION OF STUDY POPULATION
The study population consists of school children aged between 5 and 19 years. Children within the selected age range fall mainly in the indicator age population of these helminthdiseases [10, 19]. Also pupils in lower classes are usually under age and would be difficult to manage as stated by Arionla [2]. Enrolled school children were recruited for the purpose of this study including males and females. A systematic stratified random sampling method was used in selecting children for the research [19]. Children below 5 years, above 19 years and adults were excluded from this study. The children who did not give their consent to take part in the study were also excluded.

2.5 COLLECTION OF STOOL SAMPLES

Prior to the time of stool sample collection, permission was obtained from the head teachers and staff. Pupils and students were released from their classes, lined up outside class by class. The study population were instructed on how to collect the stool sample, not contaminating the sample with their urine. Study subjects were issued with 2 duly labelled and numbered 25mls of well capped universal containers. One was used for the stool collection. After collecting the stool samples, children were asked to line up and a simple structured questionnaire was used for the collection of bio data information such as type of toilet facility, source of water supply for domestic use and water contact activities. The simple structured questionnaires were duly numbered in accordance with the number on each sample container. All samples collected were transported to examination centres (Mangu General Hospital and College of Health Technology Zawan).

The collection of samples were made possible with the assistance of three Medical Laboratory Technicians and one Medical Laboratory Assistant, who were employed to assist in the course of this study. These medical laboratory personnels were trained on how to collect and process the stool samples for the purpose of microscopic examinations.

2.6 PROCESSING AND EXAMINATION OF STOOL SAMPLES

All stools collected were viewed macroscopically before they were processed for microscopic examination. Kato Katz technique as published by WHO [19]. was used for the processing and examination of all the stool samples.

Data Analysis:

Data was edited during and after collection, coded, classified to adjust for any missing information entered. Descriptive statistics were computed and categorical variables were compared using Chi-square test using SPSS statistical package and Microsoft excel package. All statistical tests were considered significant at $p < 0.05$.

III.   RESULT

Out of 684 stools samples collected and examined from school aged children in Mangu Local Government Area , Plateau State, Nigeria, 60(8.77%) were found to be infected with the ova of Hookworm.

The results are as shown in the tables bellow:

Table 1
Prevalence of hookworm infection among School-Aged Children in Mangu L.G.A. of Plateau State, Nigeria

Soil-transmitted helminth	No. examined	No. infected	% infected
Ascaris lumbricoides	684	60	8.77
Total	684	60	8.77

The result showed that hookworm infection is present among school-aged children in the study area, (Table 1). The overall study on the prevalence of hookworm infection among school-aged children in Mangu LGA revealed that out of 684 stool samples examined, 60(8.77%) of the children were infected with hookworm (Table 1).

Table 2
Gender-Related Prevalence of hookworm infection among School-Aged Children in Mangu L.G.A, Plateau State

Gender	No. Examined	No. Positive	% infected
male	362	34	9.39
female	322	26	8.07
Total	684	60	8.77

Table 2 shows the gender-related prevalence of Hookworm among school-aged children in the study area. Males were more infected with hookworms 34(9.39%) than females 26(8.0%). From the result obtained, it is observed that male children are more prone to contaminated soils and are more involved in farming activities. Children of as young as 5 years are actively involved in farming activities in wet and dry seasons.

Table 3: Age-Related Prevalence of Hookworm infection among School-Aged Children in Mangu L.G.A, Plateau State

Age Group (years)	No. Examined	No. Positive	Prevalence %
5-9	194	25	12.89
10-14	488	35	7.81
15-19	42	0.0	0.00
Total	684	60	8.77

The result of age-related prevalence of hookworms indicates that children of ages 5-9 years had higher infections of 25 (12.89%), followed by the children of age group 10-14 years 35 (7.81%), there was no infections of hookworm recorded in children of 15-19 years.

Table 4: Prevalence of Hookworm infection among School Children According to Districts in Mangu L.G.A. in Plateau State, Nigeria

Districts	No. examined	No. infected	% infected
Gindri	165	1	0.61
Mangu	113	5	4.42
Panyam	198	20	10.10
Ampang west	100	20	20.00
Mangun	60	7	11.67
Kerang	48	7	14.58
Total	684	60	8.77

A total of 684 school aged children took part in the study; 165 from Gindri, 113 from Mangu, 198 from Panyam, 100 from Ampang west, 60 from Mangun, and 48 from Kerang.

The district which had the highest number of school children with hookworm imfection is Ampang west, with a prevalence of 20%, followed by Kerang district with prevalence of 14.58%. Mangun, Panyam, and Mangu districts had prevalences of 11.67%, 10.10%, and 4.42% respectively. While children from Gindiri district had the least hookworm infection of 0.61%.

Table 5: Prevalence of hookworm infection Among School-Aged Children according to schools in Mangu L.G.A. of Plateau State.

Schools	No. examined	No. infected	% infected
Kam'ar Comp. Sec. Sch. Mangu	58	2	3.45
L.E.A Prim. Sch. Millet	55	5	4.42
G.S.S. Panyam	44	3	6.82
L.E.A. Prim. Sch. Panyam Central	72	8	11..11
Veroduns Prim. Sch. Panyam	82	9	10.98
Pilot Sci. Prim. Sch. Mangun	60	7	11.67
L.E.A. Prim. Sch. Larpiya	50	9	18.00
L.G.E.D. Bwonpe Central	50	11	22.00
L.E.A. Prim. Sch. Kuntup	48	7	14.53
L.E.A Pri. Sch. SabonBarki	69	1	1.45
DEM. Pri.Sch. Gindiri	96	0	0.00
Total	684	60	8.77

In all the schools that were surveyed, hookworm infections were predominant among the school-aged children except in Demonstration Primary School Gindiri. Hookworm was highest 11(22.00%) among children of L.G.E.D Bwonpe Central. This was followed by L.E.A Primary School Larpiya, with prevalence of 9(18%). Children from L.E.A. Primary School Kuntup, Pilot Science Primary School Mangun and L.E.A primary School Panyam Central had prevalence of 7(14.58%), 7(11.67%) and 8(11.11%) respectively. While hookworm infection among the children from Veroduns Private School Panyam, G.S.S Panyam and L.E.A Primary School Millet and

Kam'ar Comprehensive Secondary School Mangu were 9(10.98%), 3(6.82%), 3(5.45%) and 2(3.45%) respectively. The least infected with hookworm were children from L.E.A Primary School

SabonBarki in Gindiri with prevalence of 1(1.45%). Children from Demonstration Primary School Gindiri did not record hookworm infection.

Table 6: Hookworm Infections in relation to availability of toilet facilities

Toilet Facility	No. examined	No. infected	% infected
No Toilet/Bush	471	51	10.83
Pit Latrine	131	4	3.03
Water System	82	5	6.09
Total	684	60	8.77

Table 6 shows the distribution of hookworminfection among school-aged children in the study area according to the type of toilet facilities used.

Infectivity with hookworm parasites among children that defaecate in the bush indicated that hookworm infection was high 51(10.83%) among the children. The children who used water system toilets had infection of hookworm

5(6.09%). Children who use pit toilets had prevalence of 4(3.03%) for hookworm infection. High risk occured in children who had no toilet facilities, followed by those who use water system, while those who use pit toilet were the least. Prevalence ofhookworm infectionin children according to toilet facilities used did not differ significantly at 5% level (P> 0.05)

Table 7 : Hookworm Infections in Relation to Sources of Drinking Water

Source of Water	No. examined	No. infected	% infected
Borehole	255	18	7.06
River /Stream	51	8	15.69
Well	378	34	8.99
Total	684	60	8.77

Table 7 shows the distribution of hookworm infection according to sources of drinking water. The results ofhookworm infection according to sources of drinking water revealed that the children who obtained their water from streams and rivers had the highest infection. Out of 51 stool samples that were examined for children who obtain their water from the stream/river, 8(15.69%) pupils were infected with hookworm. This was followed by those who obtained their water from hand dug wells;out of 378 stools examined, 34(8.99%) had eggs of hookworm.Followed by those who obtain their water from borehole, with prevalence of 18(7.06%). Prevalence rates in relation to water sources did not vary significantly (P> 0.05). Odds ratio revealed association between infection and use of Borehole water (OR=3.2), River water (OR=1.4), and no association between infection and use of Well water (OR=0.24).

IV.   DISCUSSION
Hookworm infection is a public health problem and is more severe in countries with scarce resources. Poor hygiene, open defecation, habit of walking with bare foot and scarcity of good source

of water are major determinants for the high prevalence of hookworm.

The overall prevalence of hookworm infections (8.77%) in the present study was far lower than the one reported by [4]. among Pupils of School- Aged children in Jos-North L.G.A, Plateau State, Nigeria. They recorded a prevalence of 22.6% for hookworm infection among the children. It is also far higher than the one done by KennethNnamdiOpara et al.(2021), who recorded a hookworm prevalence of 3.02% among Primary School Children in Biase Local Government Area (LGA), Cross River State, Nigeria.But it is slightly similar with the findings of   [3,4,6,8,14]. who found a prevalence of 7.0% among children attending Township Primary School, Jos, Plateau State, Nigeria.

Most of the time, hookworm transmission is through skin penetration, but sometimes hookworm parasites may be transmitted to human beings by ingestion of filariform larvae of Ancylostomaduodenalein contaminated food. The results obtained in this research supports the fact that in developing countries, including Nigeria, intestinal helminths including soil-transmitted helminths have prevailed due to poor living

standard, poor environemntalsaniation and ignorance of health-promoting behaviours.

Poor sanitation and defaecation in open field greatly favour transmission of worm infection especially in schools resulting in high endemicity of hookworm infection. Proper utilization of latrines and good hand washing habits are ideal for prevention of intestinal parasitosis. In the present study, children who were unable to utilize latrines and wash hands properly were susceptible to be infected by hookworm parasite. This finding was similar with previous study conducted by [9]. inBiase, Southern Nigeria. It is also similar with the ones conducted in NorthWest Ethiopia and rural community of Thailand.

Depending on the prevalence in endemic area, de-worming should be done for helminthic infections. Dewormed children in the present study showed low prevalence of hookworm parasite infection. This result was in agreement with previous studies in Western Uganda.

V. CONCLUSION

The prevalence of hookworm infection was high among school aged children. There is still the presence of hookworm infection in the study area, despite the efforts of carter centre and other organizations in curbing the disease through mass treatment of school children in some of the schools in the area as discovered and informed during the course of this research.

About 68.86% of the study populations do not have any form of toilet facility, and so are still the sources of their water and soil contamination with their waste disposed in the open environment. The study has clearly demonstrated that the risk of infection with hookworm increases with activities that require frequent contact with contaminated soil and water. It is believed that deworming of infected persons, creating awareness through campaign and education about the disease and its mode of transmission will greatly decrease the exposure to hookworm infection.

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