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**PREVALENCE OF HOOKWORM INFECTION AMONG PEASANT FARMERS IN
SELECTED LOCAL GOVERNMENT AREAS OF KADUNA STATE, NIGERIA**

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ABSTRACT

This study aimed at determining the prevalence of hookworm infection among peasant farmers in selected Local Government Areas (LGAs) of Kaduna State, Nigeria. A cross sectional, descriptive study was carried out between November 2014 and October 2015. One thousand two hundred (1200) eligible peasant farmers were enrolled in the study. One LGA was selected from each of three Senatorial zone of Kaduna State by simple random sampling method of which four hundred (400) stool samples were collected from each of the three LGAs. The results obtained showed the overall prevalence of hookworm infection in the study population using microscopy technique to be 18.7%. In respect to LGA, prevalence rate of hookworm infection was 24.0% in Jema'a, 17.3% in Chikun and 14.8% in Zaria LGA respectively. The prevalence of hookworm infection was found to be significantly associated with the studied LGA ($P < 0.002$). Hookworm infection among different age groups revealed higher prevalence of 25.0% among middle age individuals between 40 to 49 years followed by 70 – 79 years (21.3%), 60 – 69 years (20.2%), > 80 years (19.6%), 50 – 59 years (18.3%), 30 – 39 years (17.1%), 20 – 29 years (15.8%) and the least was 10 – 19 years (12.5%). Higher prevalence of hookworm infection was recorded among female (21.7%) than male (16.1%) which was of statistical significant (P Value = 0.013). The results of this study indicated an overall prevalence rate of hookworm infection of 18.7% among peasant farmers in Kaduna State. This indicates a potential risk of severe anaemia among individuals particularly the vulnerable groups such as pregnant women and children of school age who participate in farming. In conclusion, this study revealed the transmission of human hookworm among peasant farmers in Kaduna State to be at alarming rate. Therefore, major prevention and control measures should be adopted to avoid further spread of the infection; and more so, there is a need for prompt treatment of the infected persons as well as creating a law that will prohibit indiscriminate defecation on farm lands.

KEYWORDS: Peasant farmers, Microscopy technique, Prevalence, hookworm, Kaduna State, Nigeria.

INTRODUCTION

Hookworms are nematodes belonging to the family *Ancylostomatidae*, super-family *Strongyloidea*. Human hookworm infection is a soil-transmitted infection caused by *Necator americanus* and *Ancylostoma duodenale*. It is the leading cause of anaemia and protein malnutrition, afflicting an estimated 740 million people in the developing nations of the tropics (Cheesebrough, 2005; CDC, 2013). Hookworm infection is spread by faecal contamination of the soil, infection occurs when infective third-stage filariform larvae (L_3) penetrate the hands, feet, arms or legs, especially when a person walk with bare-feet (Paniker and Jayaram, 2007). Signs of advanced severe infection includes anaemia and protein deficiency, including emaciation, cardiac failure and abdominal distension (Ayoya *et al*, 2006; Drisdelle, 2006). Farming also has an important influence on hookworm epidemiology (Damen *et al*, 2007).

The risk factors for Hookworm infection include poor personal hygiene and household sanitation which in turn are influenced by differences in socio-economic status (Hotez, 2009). Some studies have demonstrated that helminthiasis; particularly hookworm infection is associated with absence of latrine and socio-economic status (Brooker *et al*, 2004; Thomas, 2009). Occupation also has an important influence on hookworm epidemiology; engaging in agricultural pursuits remains a common denominator for human hookworm infection (Williams *et al.*, 2014). Hookworm has been noted to be more common in families who are involved in agricultural pursuits. There is higher prevalence among vegetable growers and farmers (Damen *et al.*, 2007).

The role played by farmers in the economic development of Nigeria after petroleum cannot be over emphasized. Hookworm infection which is common among farmers causes severe anaemia leading to high morbidity and

mortality and consequently causing low productivity and consequently food insecurity in Nigeria. This study assessed the prevalence of hookworm infection among peasant farmers and the associated risk factors.

METHODOLOGY

Study design

A cross sectional, descriptive study was carried out between November 2014 and October 2015. One thousand two hundred eligible peasant farmers were enrolled in the study. The study was carried out in some selected LGAs of Kaduna State, Nigeria by simple random sampling method.

Study population

The population studied comprised of voluntary consented peasant farmers in Jema'a, Chikun and Zaria Local Government Areas in Southern, Central and Northern zones of Kaduna State respectively, where farming activities are very high involving the vulnerable groups (women and children between ages 10 and 15 years). The age considered in this study was 10 years and above including males and females peasant farmers. Ethical clearance was obtained from Kaduna State Ministry of Health. A feasibility study of the selected LGAs was carried out with the co-operation of the district heads; sensitization lecture was given to the people in all the study areas.

Sample Collection

Sample Size: Using a reported 36% prevalence of intestinal parasitic contamination of vegetables in Jos, Plateau State, Nigeria by Damen *et al* (2007), the sample size was calculated using the formula of Israel (1992);

$$n = \frac{Z^2pq}{d^2}$$

Where n = number of samples to be collected

Z = standard normal distribution at 95% confidence limit = 1.96

P = prevalence rate of infection of previous study = 36% = 0.36

q = 1 - p

d = absolute desired precision = 0.05%

Therefore,

$$n = \frac{1.96^2 \times 0.36 \times 0.64}{0.05^2}$$

$$n = 0.8851046$$

$$0.0025$$

$$n = 354.04184$$

n = 354 and approximated to 400 samples.

The calculated sample size was 354 but was estimated to four hundred (400) stool samples; these were collected from each Senatorial zone of which a total of one thousand two hundred (1,200) stool samples were collected from the three senatorial zones of the state and used for the study.

Inclusion and Exclusion Criteria

Children aged 10 years and above who participates actively or assist their parents in farming were included in the study and all consenting farmers.

Children below 10 years of age were excluded from the study, non-consenting parents together with their children as well as all civil servants, business or traders and those who do not depend on farming as their main source of income and livelihood were excluded.

Sample Analysis

A total of 1,200 samples were collected, comprising 400 samples from each Local Government of the three senatorial zones of the state. Specimens were collected using clean, leak-proof, and transparent, screw capped stool containers which were labelled and packed in insulated iceboxes and transported to the laboratories in Microbiology Department Ahmadu Bello University Zaria. The samples were analyzed starting with Macroscopy i.e. checking for colour, consistency and constituents of the stool.

Microscopy was carried out using Direct Wet Mount and Formal-Ether Concentration Techniques; Using an applicator stick, about 1g (pea-size) of the stool was taken from a mixed specimen into about 10 ml of normal saline (physiological saline) it was emulsified and sieved through gauze using glass funnel into a pointed end glass centrifuge tube then washed twice by centrifuging at 3000rpm for 5 minutes, the supernatant was discarded and the deposit resuspended and transferred into a screw-cap centrifuge tube then 7ml of 10% formal saline was added then followed by 3ml of ether, it was covered and shake vigorously for 20 seconds, it was centrifuged at 3000rpm for 3 minutes. After centrifuging, the parasite's ova were sedimented to the bottom of the tube and the faecal – debris was collected in a layer between the ether and formal saline, using the applicator stick, other 3 layers were removed leaving only the sediment at the bottom of the tube which were suspended and a drop of it placed at the centre of a clean grease free slide and covered with cover slip carefully avoiding air bubbles and examined systematically under x10 and x40 objectives respectively (Cheesbrough, 2015). The results were recorded as Scanty 1-3 (+) per preparation, few 4-10 (++) , Moderate 11-20 (+++) and Heavy 21-40 (++++) (Cheesbrough, 2010).

Data Analysis

The results obtained were analyzed using Statistical Package for Social Science (SPSS) Version 22. Pearson chi-square test was used to determine the association between variables. Statistical significance was indicated by a two-tailed test at 95% confidence intervals, $P \leq 0.05$ was considered significant.

RESULTS

Out of the 1,200 stool samples examined, the overall prevalence of hookworm was 18.7% (224/1200). In

respect to LGA, prevalence of hookworm infection was 96 (24.0%) in Jema'a, 69 (17.3%) in Chikun and 59 (14.8%) in Zaria Local Government Area respectively (Table 1).

Table 1: Prevalence of Hookworm Infection In three Local Government Areas of Kaduna State.

Local Govt Area	Number Examined	Number Positive (%)	Number Negative (%)	p-value
Jema'a	400	96 (24.0)	304 (76.0)	0.002
Chikun	400	69 (17.3)	331 (82.8)	
Zaria	400	59 (14.8)	341 (85.3)	
Total	1, 200	24 (18.7)	976 (81.3%)	

The prevalence of hookworm infection in relation to age revealed that farmers from 10 to 19 years old had a prevalence of 12.5%, 20 to 29 years had 15.8%, 30 to 39 years had 17.1%, 40 to 49 years had 25.0%, 50 to 59 years had 18.3%, 60 to 69 years had 20.2%, 70 to 79 years had 21.3% and those that were 80 years and above had a prevalence of 19.6%. The mean age of the respondents was 45.5 years which had hookworm

prevalence rate of 50% and their age range was 10 to 80 years. There was statistical significant difference in prevalence between different age groups ($P < 0.05$). The study population comprises 657 males and 543 females, out of the 657 males 106 (16.1%) had hookworm infection while 118 (21.7%) was observed in females. There was statistical significant difference in prevalence of hookworm in males and females ($P < 0.05$).

Table 2: Prevalence of Hookworm Infection in Relation to Age and Gender Among Peasant Farmers in Kaduna State, Nigeria.

Age Group (Years)	Number of Samples Examined	Number Positive (%)	p-value
10-19	24	3 (12.5)	
20-29	260	41(15.8)	
30-39	333	57 (17.1)	
40-49	160	40 (25.0)	
50-59	164	30 (18.3)	0.045
60-69	109	22 (20.2)	
70-79	89	19 (21.3)	
≥ 80	61	12 (19.6)	
Gender			
Female	543	118 (21.7)	0.013
Male	657	106 (16.1)	

DISCUSSION

The result of microscopy, showed higher prevalence of Hookworm infection in Jema'a LGA of the Southern Senatorial Zone followed by Chikun LGA of the Central Senatorial Zone and Zaria LGA of Northern Senatorial Zone had the least with a statistical significant difference. The overall prevalence of hookworm infection in the study area (Kaduna State) was 18.7%. The differences may be due to the topography of the location, the climatic condition, type of soil and the tradition as well as the agricultural cultural practices of the people and their environmental sanitary attributes.

It was also noted that most of the farmers in Zaria LGA have the privileged of using pipe borne water and bore holes as their source of drinking water while most of the farmers in Jema'a and Chikun uses mostly water from the rivers and wells which are more exposed to all kinds of pollution or faecal contamination. They also had lower

number of toilet facilities and many of them undergo backyard farming barefooted. Hence, these could be the reasons for their differences in prevalence.

This study observed higher prevalence of 25.0% among the age bracket of 40 -49 years. This could be attributed to the fact that the middle age individuals are physically active and are more likely to participate fully in farming activities and other work such as digging of tunnels which predisposes them to hookworm infection. Thus, the infection increases with increase in age and sometimes drops gradually among elderly individuals as their farming and other predisposing activities drops due to old age. The younger individuals from 10 – 19 years had the least prevalence (12.5%) of hookworm infection in this study, probably due to the fact that they are of school ages, thus do not participate fully in farming activities which is the main predisposing factor of hookworm infection.

There was statistical significance of Hookworm infection in respect to gender; infection in females was higher (21.7%) while that of males was 16.1%. Culture, tradition and social biases in behaviour as well as occupation have been established as risk factors influencing hookworm infection prevalence rates in females and some ethnic differences. For example, in Jema'a and Chikun LGAs, the females carry out most of the planting and harvesting apart from participating in the cultivation or tilling of the farm land, while male only participate in the cultivation of the farm land according to culture and tradition of the people in these areas. Hence the chances of females getting infected are more than males. Another contributing factor is the engagement in other domestic works such as washing of clothes or napkins infected or contaminated with faeces, cleaning of the house and its environs could also contribute to the females having higher infection than males.

CONCLUSIONS

This study showed that Hookworm infection is a common parasitic infection among peasant farmers in the study area (18.7%). The prevalence of hookworm in respect to Local Government Areas was found to be statistically significant; Jema'a having the highest (24%) followed by Chikun (17.3%) and Zaria the least (14.8%). The prevalence based on age groups showed that individuals of the middle age between 40 – 49 years was the highest (25%), these are the most active individuals that participate actively in farming. Prevalence based on gender was observed to be higher in female (21.7%) than male (16.1%). The results obtained in this study indicates that hookworm infection is common among peasant farmers in the study area and the most active middle age group individuals as well as women who are the vulnerable groups are most affected.

Recommendations

There should be awareness campaign programmes in respect to the indiscriminate defecation on farm land and the use of untreated faeces as manure on farms.

The health of this productive sector of this economy should be taken seriously also considering the economic recession of the country and the calling by the Nigerian Government to all Nigerians to engage in farming. Thus, there is need to educate the populace on the effect of hookworm infection and the predisposing risk factors associated with it. There is also need for mass screening of peasant farmers in all the LGAs of Kaduna State for hookworm infection which should be followed by treatment and possible preventive measures such as building of latrines and public toilets to prevent indiscriminate defecation on farm lands.

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