**PREVALENCE OF INTESTINAL PARASITES AMONG FARMERS IN MAKURDI LOCAL GOVERNMENT AREA OF BENUE STATE,** **NIGERIA**

**ABSTRACT**

Human intestinal parasites are the major public health challenges among farmers, particularly in the tropics and sub-tropic regions of the world. It has been estimated that approximately 1.2 billion people harbour at least one species of intestinal parasite world-wide. The aim of this research was to investigate the prevalence of intestinal parasites among farmers in Fiidi, Wailomayo, North Bank II, Ankpa-Wadata and South-central Wards of Makurdi Local Government Area of Benue State. Stool Samples were collected from 500 farmers in five Council Wards with 100 samples from each ward. Each participant was instructed to provide early morning faecal specimen and each of them was interviewed using structural questionnaire. The stool specimens were examined using structural wet preparation and formol ether concentration methods. Among the gender distribution of infection, more parasites were recorded among the 250 females, 131 (26.2%) while in the male group of 250, 128 (25.6%) was recorded. The age group most infected was 10-20 years with 104 (20.8%) and 31-40 years with 74 (14.8%). The age group with the least infection was those in age group 51-60, 17 (3.4%). The farmers in Ankpa/Wadata recorded the highest parasite infection with 61 (12.2%) and North Bank II participants recorded the lowest with 46 (9.2%). Based on educational qualifications of the farmers, those with primary education were the most infected with 116 (23.2%), while those with non-formal and secondary education were the least infected with 45 (9.0%) each. In terms of social practices by the farmers during farming activities, those who never wash their fruits and hands before eating were most infected with 217 (43.4%). From the study, it can be deduced that more than half of the farmers were infected with intestinal parasites, 259 (51.8%). It is therefore recommended that farmers should be encouraged to deworm themselves as often as possible to keep them in good health.

**Keywords: Intestinal Parasites, Stool sample,** **public Health, farmers**

1. **INTRODUCTION**

Human intestinal parasites are the major public Health challenge among farmers, particularly in the tropical and sub-tropical region of the world. Most intestinal infections result from ingestion of food or water that has been contaminated with human faeces; often most farmers don’t wash their hands well before eating. However, parasites such as *Ancylostoma duodenale* infect through unbroken skin and migrate finally to the intestine. High community prevalence and intensity of soil transmitted parasites usually indicate that ingestion of the infective stages occur regularly and frequently in that particular community (Eyamo et al., 2019). Contact with such contaminated environment present a risk to people especially farmers in communities with poor water supply and sanitary condition.

It has been estimated that approximately 1.2 billon people harbour at least one species of intestinal parasite worldwide (Bethany *et al.*, 2006). It is estimated that 50 - 100 million people are infected with *Amoebiasis, Strongyloides stercoralis*, *Ancylostoma duodenale* with a high prevalence in tropical region of Africa, Asia and South America particularly in Brazil (Carvalho and Dafonseca, 2004).

Parasitic infections are chronic infections acquired during farming activities or in early childhood. People are infected with more than one parasite, and many of them persist into old age unless cured (Chan, 1997 and Bundy, 1998). This is because their farming environment supports continuous breeding of vectors and their intermediate hosts that could encourage re-infection. In spite of some improvement in health care delivery, the problem of parasitic infections continues to be acute. World Health Organization (2001) estimated that more than 2,000 million people are infected with *schistosomiasis* and Soil-Transmitted parasites worldwide, more than 300 million suffer from associated severe morbidity. Intestinal parasites contribute to loss of appetite, anaemia and impaired growth in children of school age (Dickson *et al.*, 2000). Epidemiological surveys have revealed that, poor sanitation and inappropriate environment conditions coupled with indiscriminate defecation and contamination of water bodies are the most important predisposing factors to intestinal worm infection (Brooker *et al.*, 2008). Other practices such as hand washing, disposal of refuse, personal hygiene such as wearing of shoes and other protective wears, when not done properly may contribute to the infection or picking of these worms from the environment (Stoltzfus *et al.*, 1997)

In Nigeria, various studies exist on degrees of intestinal parasites reported with prevalence rates from 2.4% to 73.3% (Abdullahi, *et al.*, 2000 and Beasley *et al.,* 2002). To reduce the prevalence of infection among farmers and children, many approaches was introduced. One of such programmes was regular deworming of farmers and children and hygiene education

1. **MATERIAL AND METHODS**

**2.1 Study Design**

The study is aimed at investigating the prevalence of intestinal parasites among farmers in Fiidi, Wailomayo, North Bank II, Ankpa-Wadata and South-Central Mission wards of Makurdi Local Government Area of Benue State. This is to understand the risk factors with personal or environmental conditions that may contribute to parasitic infections among farmers in these areas.

A total population of five hundred (500) farmers were examined to assess intestinal parasites, infestation in relation to sex, age and dermographic studies. Replicate sample was collected from two hundred and fifty (250) males and two hundred and fifty (250) females. One hundred (100) stool samples were collected from each council ward in replicate with fifty (50) males and fifty (50) females and examined for intestinal parasites.

**2.2 Study Population**

The study was carried out in five council wards of Makurdi Local Government. These include Fiidi, Wailomayo, North Bank II, Ankpa-Wadata and South-Central Mission among farmers.

**2.3 Sample Size Determination**

The sample size was determined using the standard formula adopted from Naing *et al.,* (2006).

 N = Z2Pq

 d2

Where n = the desired Sample size, when the population is greater than 10,000

Z=standard deviation at 95% confidence interval of 1.96.

P= the value of 60% were used according to Daniel, 1999, Lwanga and Lemeshow, 1991 (Naing *et al.,* 2006)

Q= I-p

=1-0.6

=0.6

 d =level of precision or standard error using 95% confidence interval at 0.5.

Therefore:

 n= (1.96)2 x 0.6 x 0.6/ 0.052

 = 3.8416×0.36/0.0025 =553.19

**2.4 Sample Collection and Stool samples preparation**

Early morning stool samples were collected, labeled; with date, time of collection, sex, council ward and questionnaire filled. The collected stool samples were preserved by using 10% formal saline to keep protozoan morphology and to prevent the continued development of some helminth eggs and larvae.

**2.5 Detecting of parasites stages in stool samples**

Macroscopic examinationwas carried out on all stool samples to determine stool consistency color, presence of blood, mucus, adult nematodes and Proglottids of Cestoda.

**2.6 Direct Wet Mount Method**

Direct wet mount was applied according to Arora & Biji, 2010). One drop of saline NaCl (0.85%) was placed on slide by using dropper pipette. A small amount of stool sample was picked up by using a wooden applicator stick. The stool was emulsified in the saline, on the slide. The suspension was covered with 22mm cover-slip. The suspension was systematically scanned with 10X objective and 40X objective to identify any parasites: cyst, egg, larvae/trophozoids and adult worm.

**2.7 Formol-ether concentration (sedimentation) method**

As stool samples were preserved in 10% formal saline, the procedure applied was that according to Garcia and Bruckner (2001).

**2.8 Stool Samples**

The formol-ether concentration method was carried out as follows: using an applicator stick, a stool sample was added into a test tube containing 7 mls of 10% formol-saline. In cases of inconsistent samples (watery and semi-solid) a clean pasteur pipette was used in transferring some quantity into the test tube containing 7 mls of the 10% formol-saline. The stool was thoroughly emulsified and filtered into another clean centrifuge tube. 3 mls of ether was added to the stool suspension. The tube was stoppered and shaken vigorously for 30 seconds to 1 minute. This mixture was centrifuged at 200 rpm for 3 minutes. Four distinct layers (the deposit formol-saline, stool debris and ether at the top-most) were formed after centrifugation. The stool debris was dislodged with an applicator stick and the upper 3 layers poured off without disturbing the deposit. The deposit was pipette onto a clean-grease-free microscope slide and covered with a cover slip avoiding air bubbles and over floating the sample off the slide. Examination was carried out under 10x and the 40x objectives of the microscope for the detection of ova and cyst of parasites.

**2.9 Data Entry and Analysis**

After the experimental work and filling of the questionnaire were completed, data entry was done using SPSS (Statistical Package for Social Science) software version 21. The simple percentage, means and chi-square analysis tests were used to test the difference proportions. A P- value less than 0.05 were considered to represent statistical significance.

1. **RESULTS**
	1. **Prevalence of Total Parasite among Farmers in Relation to Sample Location**

One hundred samples were collected from Fiidi ward, 50 (10.0%) positive. 100 samples from Wailomayo ward, 50 (10.0%) positive. 100 samples from North Bank II, 46 (9.2%) were positive. 100 samples collected from Ankpa–Wadata ward, 61 (12.2%) were positive, and 100 samples taken from South-Central ward, 52 (10.4%) were positive.

**3.2 Prevalence of Total Parasite among farmers in relation to Age Group**

A total of 500 farmers were investigated for prevalence of intestinal parasites in 5 council wards in Makurdi Local Government Area using their faecal samples and structural designed questionnaires. Out of 500 farmers investigated for Prevalence of intestinal parasites, 259 (51.8%) were positive and 241 (48.2%) were negative. The parasites seen were *Ascaris lumbricoide* 7 (1.4%), *Emtamoeba histolytica* 155 (31.0%), *Hook worm* 58 (11.6%), *Strongylode Stercolaris* 7 (1.4), *Schistosoma Mansoni* 16 (3.2%) and *Trichomonas hominis* 16 (3.2%).

**3.3 Prevalence of total Parasite among farmer in relation to Sex**

Prevalence of parasites among farmers in relation to age group were sampled among 10-20, 21-30, 31-40, 41-50, 51-60 and 60 & above with the prevalence of 20.8%, 4.0%, 14.8%, 4.8%, 3.4% and 5.0% respectively. A total of 250 males were sampled and 128(25.6%) were positive. Also 250 female were sampled and 131 (26.2%) were positive.

**3.4 Prevalence of Total Parasite among Farmers in Relation to Educational Level**

122 were holders of primary school certificate and 116(23.2%) were positive. 91 were secondary school certificate holders and 45(9.0%) were positive. 102 with tertiary school certificate were sampled and 53(10.6%) were positive. Also 85 non-formal education farmers were sampled and 45(9.0%) were positive.

**3.5 Prevalence of Total Parasite among Farmers in Relation to Sources of Drinking Water**

A total of 165 farmers got their water from well and had (17.4%) positive. Those that got their water from water vendors were 243, and 132 (26.4%) were positive, and also those that got their water from bore holes were 92, and 40(8.0%) were positive

**Table 1: Prevalence of Total Parasite among Farmers in Relation to Sample Location**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sample location** | **Sample** | **Positive (%)** | **Negative (%)** |
| Fiidi | 100 | 50 (10.0%) | 50 (10.0%) |
| Wailomayo | 100 | 50 (10.0%) | 50 (10.0%) |
| Northbank II | 100 | 46 (9.2%) | 54 (10.8%) |
| Ankpa/Wadata | 100 | 61 (12.2%) | 39 (7.8%) |
| South Central Mission | 100 | 52 (10.4%) | 48 (9.6%) |
| **Total** | **500** | **259 (51.8%)** | **241 (48.2%)** |

X2=4.998, df=4, P=0.287, P> 0.05

**Table 2: Prevalence of Total Parasite among farmers in relation to Age Group**

|  |  |  |  |
| --- | --- | --- | --- |
| **Age Group** | **No of Sample** | **Positive (%)** | **Negative (%)** |
| 10-20 | 196 | 104 (20.8%) | 92 (18.4%) |
| 21-30 | 44 | 20 (4.0%) | 24 (4.8%) |
| 31-40 | 130 | 74 (14.8%) | 56 (11.2%) |
| 41-50 | 49 | 24 (4.8%) | 25 (5.0%) |
| 51-60 | 36 | 17 (3.4%) | 19 (3.8%) |
| 60-above | 45 | 20 (4.0%) | 25 (5.0%) |
| **Total** | **500** | **259 (51.8%)** | **241 (48.2%)** |

X2 =3.634, df=5, P=0.603, P> 0.05

**Table 3: Prevalence of total Parasite among farmer in relation to Sex**

|  |  |  |  |
| --- | --- | --- | --- |
| **Gender** | **Number of Sample** | **Positive (%)** | **Negative (%)** |
| Males | 250 | 128 (25.6%) | 122 (24.4%) |
| Females | 250 | 131 (26.2%) | 119 (23.8%) |
| **Total** | **500** | **259 (51.8%)** | **241 (48.2%)** |

X2=0.072, df=1, P=0.788, P>0.05

**Table 4: Prevalence of Total Parasite among Farmers in Relation to Educational Level**

|  |  |  |  |
| --- | --- | --- | --- |
| **Educational Status** | **No of Sample** | **Positive (%)** | **Negative (%)** |
| Primary | 222 | 116 (23.2%) | 106 (21.2%) |
| Secondary | 91 | 45 (9.0%) | 46 (9.2%) |
| Tertiary | 102 | 53 (10.6%) | 49 (9.8%) |
| Non formal | 85 | 45 (9.0%) | 40 (8.0%) |
| **Total** | **500** | **259 (51.8%)** | **241 (48.2%)** |

X2=0.265, df=3, P=0.967, P> 0.05

**Table 5: Prevalence of Total Parasite among Farmers in Relation to Sources of Drinking Water**

|  |  |  |  |
| --- | --- | --- | --- |
| **Source of Drinking Water** | **No of Sample** | **Positive (%)** | **Negative (%)** |
| Well | 165 | 87 (17.4%) | 78 (15.6%) |
| Water vendors | 243 | 132 (26.4%) | 111 (22.2%) |
| Boreholes | 92 | 40 (8.0%) | 52 (10.4%) |
| **Total** | **500** | **259 (51.8%)** | **241 (48.2%)** |

X2= 3.227, df=2, P=0.199, P> 0.05

1. **DISCUSSION**

In this study, a total prevalence of parasitic infection (51.8%) was recorded similar to the finding of Tyoalumun *et al.* (2016) who did a cross-sectional study among 418 farmers in Gwer Local Government in rural and urban communities and reported 51.0%. It is also in agreement with Ekpo *et al.* (2007) who recorded 50% and Ogbuagu *et al.* (2010) who also recorded 57.0% prevalence of intestinal parasites in his work at Makurdi It is also in agreement with Laka *et al.* (2000) in Kaduna state who reported 55.% prevalence among farmers. The slightly low prevalence of 48.40% was recorded by Awolaju and Marenikeji (2009) among farmers in five communities in Ogun state South-west Nigeria and 40.8% among population of the Gaza Strip, Palestine by Nahla *et al.* (2014). A much higher prevalence was observed in Kampala, Uganda among urban farmers (75.9%) by Fubrimann *et al*. (2016) and in Osun State by Ijabuwe and Olugungu (2006) with (72.0%) prevalence. A low prevalence was also reported by Igumer *et al.* (2010) with 5.71% in Delta State and George and Adethy (2002) in Lagos who reported (16.0%) prevalence. The high prevalence in this study is likely to be associated to the low level of education.

Among the parasites *Entamoaba histolytica* was the highest prevalence (31.0%) This is in agreement with the study carried out by Banke *et al.* (2006) in Benue state who reported (53.0%) it also agreed with the study carried out by O.C.N. (2009) who reported 45.2%. However it is in contrast with the study carried out in Kaduna by Luka *et al,* (2000) who reported low prevalence of *Entamoaba histolytica* (0.3%).

 The prevalence in relation to sample location shows high prevalence in Ankpa –Wadata-council ward with (12.2%) followed by south central mission (10.4%) and last with Firdi and waitomayo (10.0%). This could be as a result of poor water supply, indiscriminate waste disposal high rate of ignorance among farmers, high number of intermediate host, poor environmental condition may be responsible for the high prevalence rate, however, there was no significant statistical analysis with P = 0.287 (P > 0.05).

Total parasites in relation to age group was considered with the age group 10 – 20 having the highest prevalence (20.8%) followed by 31 – 40 at (14.4) the study reveals there was no significant statistically analysis with P = 0.603 in their distribution.

In relation to sex, female had (26.2%) prevalence compared to (25.6%) in male. It may be that the female participate in farming activities move than their male counterparts ranging from planting to harvesting of corps.This agrees with the study of Atu *et al.* (2006). It also agreed with the study of Faruve *et al.* (2009) in Danjarima Kano North West Nigeria who reported a prevalence rate of (55. 9%) in female and (3.7%) in male however it is in disagreement with the study of Igumbor *et al.* (2010) in Ukwuani Delta South-South Nigeria with prevalence of (3.57%) in males and (2.14%) in females.

Considering the level of education, the study shows farmers with primary school certificate with highest prevalence (23.2%) Tertiary came with (10.6%) Secondary and non-formal (9.2%) there is a slight difference with the study done by OCN *et al.* (2009) where he recorded (45.2%) infection prevalence among non-formal and tertiary (34.9%) being the least.This shows that, it is not the level of attainment in education that will prevent the rate of infection but how each level inclined to health instructions thereby yielding low intestinal distribution of parasites.

Total parasites prevalence in relation to source of drinking water shows that the prevalence rate was highest among water vendors (26.4%) and least with Borne holes (8.0%).

Water vendors get the water for supply from River Benue, streams, ponds, that are highly contaminated with intestinal parasites besides their container used in supplying water are not properly washed and thereby increasing the high rate of intestinal parasites contamination. This study agreed with Jombo *et al*. (2010) on their work out in three communities of Tyogbenda, Jato Aka and Adikpo which recorded high prevalence of intestinal parasites in the two communities (70.5%) and (71.0%) respectively. The findings also agree with Salockoin Lagos, similar findings were also recorded by Araujo *et al,* and Ferrelre *et al,* in Brazil. The finding in this study and similar findings from other parts of the world like Angola, Togo, Malawi etc confirm that, intestinal parasites are still a major global public health challenges.

1. **CONCLUSION**

In this study, it shows that the prevalence of intestinal parasites is high in Makurdi Local Government Area among farmers It was also age dependent as age group of 10-20 years and 31-40years were seen to be higher with (21.8%) and (14.8%). Furthermore there was no relationship with age, sex, educational level and intensity of infection. From the results obtain from this study, it could be concluded that, Makurdi Local Government is endemic for intestinal parasite infection among farmers. It is therefore necessary that urgent steps be taken to reduce the infection rate in the community.

**Consent**

As per international standards or university standards, Participants’ written consent has been collected and preserved by the author(s).

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REFERENCES

Bethany, J, Brooker, S; Albonico, M. Geiger, S.M. Loucas, A. Diemert, and Hotez, PJ (2006). Soil-transmitted helminth infections: ascaris, trichuriasis, and *Ancylostoma duodenale*. *Lancet, 367****:****1521-32.*

Carvacho E. M. and Da-Fonseca A (2004): Epidemiological and Clinical Interaction between HTLV-1 Infection. *Journal of Parasite Immunology* 26 (11-12): 487-497.

Chan M. S (1997). The Global Burden of intestinal Nematode infection-fifty years on parasitology today 13, 438-443.

Bundy D.A. P (1998) Evaluating Measures to Control intestinal Parasitic infections: *World Health Statistics Quarterly*: 45:168-179.

WHO (2000) Bench Aids for the diagnosis and intestinal parasites. Geneva.WHO (2001) Basic Laboratory Methods in Medical Parasitology. *World Health Organization*, Geneva.

Brooker, S., Bethony, J. & Hotez, P.J. (2004). Human *Ancylostoma duodenale* infection in the 21st century. *Advances in Parasitology*, 58, 197-288.

Stolzfus R, Albonicom: Tielsch J, Chuaya H, and Savioli L.(1997) Linear Growth Retardation in Zanzibari School Children. *American Society for nutritional Science* 12(7): 10-19.

Abdullahi I.O. and Abdul-Azeez A.J. (2000). Prevalence of Intestinal parasites in some human patient in Zaria. Nigerian *Journal of Parasitology* 21:125-30.

Beasley M. Brooker S, Ndinaromatan M, Madjiouroum E.M, Baboguel M and Djenguinabe E. (2002).First Nationwide survey of the health of school children in Chad. *Tropical Medicine International Health,* 7:625-30.

Naing L, Winn T and Rusli BN (2006). Sample Size Calculator for Prevalence Studies. *Archives of Orofacial Sciences*; 1: 9-14. Available at: <http://www.kck.usm.my/ppsg/stats_resources.htm>

Arora D.R and Briji B.A (2010).*Medical Parasitogy* (3rd edition); p.235, 237. New Jersey.

Garcia L.S. and Bruckner D.A. Gool. Diagnostic medical Parasitetology (4 ed): Washington, DC.

Tyoalumun K, Abubakar S. and Nongu C (20016) prevalence of intestinal parasites infection and their Association with Nutritional status of Rural and Urban Pre-School Children in Benue State, Nigeria. *International Journal NCH AIDS* 5(2): 146-152.

Ogbuagu CN, Eneanya CL, Chukwuna C, Ogbuagu EN, Oguoma VM (2010) High Prevalence of intestinal parasite in a Nigerian Tertiary Health Institution. *Internal Journal of Parasitic Diseases* 4:2.45-86.

Awolaju B.A and Marenikeji O.A (2009). The prevalence and intensity of intestinal parasites in five communities in south-west Nigeria among farmers. *African Journal of Biotechnology.* 8 (18): 4542-4566.

Nahla M; Fayez S; Adnan I. A; Fatman S.A.M and Zakia E. A. D (2014). The prevalence of intestinal parasites among farmers in population of the Gaza Strip, Palestine. *Anunals of parasitology* 60 (4) 281-289.

Fubrimann S; Winkler MS; Kabatereine N S; Tukahebwa E M; Halage A A; Rutebemberwa E (2016). Risk of intestinal parasitic infactions in people with different Exposures to waste water and fecal sludge in Kampala, Uganda. A cross-sectional study. PloS Negl Trop Dis 10(3):76-92.

Luka SA, Ajogi and UmohJu (2002) Helminthosis among Primary school children in Lere L.G.A. of Kaduna state Nigeria. *Nigerian Journal of Parasitology* 21 109-116.

Atu B.O, Galadima, M., and Alice, F. (2006).Prevalence of Intestinal parasites in Etulo, Benue State, Nigeria. *Nigerian Journal of Parasitiology, 7:1-6.*

Eyamo, T., Girma, M., Alemayehu, T., & Bedewi, Z. (2019). Soil-transmitted helminths and other intestinal parasites among schoolchildren in southern Ethiopia. *Research and reports in tropical medicine*, 137-143.