# SOIL TRANSMITTED HELMINTH INFECTION AMONG FARMERS IN UKWA WEST LOCAL GOVERNMENT AREA, ABIA STATE, SOUTH-EAST, NIGERIA

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## ABSTRACT

BACKGROUND: Farmers like most groups of workers are faced with a multiplicity of hazards and biological hazards like Soil Transmitted Helminths - a major Public health problem in the tropical like Nigeria is one of them. This study was to determine the prevalence of Soil-Transmitted Helminths (STHs) infections among farmers in Ukwa West Local Government Area (LGA) of Abia State, South East Nigeria.

METHODS: Following ethical clearance, 290 consenting farmers were recruited to participate in this descriptive cross sectional study. They responded to pre-tested, structured, close ended interviewer administered questionnaires which probed socio-demographics, knowledge and behaviour towards STHs. Also, stool and blood samples were collected from participants and examined for helminth ova and estimation of packed cell volume respectively. A Walk Through Survey of the farms for immediate work place situation and safety was carried out. Collected data were analysed using descriptive and analytical tools.

RESULTS: There was a 33.1% prevalence of infection with STHs and a 67.6% prevalence of anaemia among respondents. Hookworm had the highest (59.6%) prevalence just as anaemia amongst farmers with STHs was higher than among respondents who were not diagnosed with the disease. Knowledge of STHs and the availability and use of personal protective equipment (PPEs) were poor.

CONCLUSION: There was a high prevalence of STHs among farmers in Ukwa West Local Government Area of Abia State, South East Nigeria occasioned inter alia by the behaviour and poor use of PPEs. Health Education, routine de-worming and use of PPEs are recommended.

KEY WORDS: Farmers, Soil Transmitted Helmints, anaemia

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## INTRODUCTION

In especially the rural tropical and subtropical regions, where water and sanitation are lacking, Soil Transmitted Helminths (STHs) infestation remains a Public Health challenge. The World Health Organization (WHO) broadly groups STHs (nematodes) into four viz: roundworm, *Ascaris lumbricoides*; whipworm, *Trichuris trichuria*; and hookworms (*Necator americanus* and *Ancylostoma duodenale*) [1].STHs are a group of parasitic worms, large multicellular organisms which cause infections in humans through contact with their eggs (Helminth ova) or ingestion from contaminated soil or food (A. *lumbricoides* and *T. trichuria*), or through penetration of the skin by the larvae present in contaminated soil (hookworm)[2,3]. It affects more than 2 billion people in more than 100 countries, with higher prevalence in sub-Saharan Africa, East Asia, China, India and the South Americas. The global burden of disease is estimated at 39 million disability-adjusted life years (DALYS). The major results for this large global burden have been anemia, reduced physical and cognitive development which eventually affect safety at work (including accidents) and productivity[3-5].

Farmers especially those in rural Nigeria are at risk of this biological hazard. The farmers can barely afford basic personal protective equipment (PPEs) and if they have, hardly wear them6. The PPEs include safety rubber boots, sun hats, cover all and gloves. From the pathophysiology of STHs, entries of these pathogens into the body include ingestion, injection and the skin. Poor or no use of PPEs increase the risk of infection of STHs. The distribution of the disease amongst farmers has been associated with many farmers who walk and work bare-foot. The infection has also been noted to occur largely in children whose parents are farmers,

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meaning the children exposure to infection may be due to the role they play in assisting their parents in the farms[8,9]. Most of these farmers and their children can hardly afford to wear shoes or any form of protective gears during farming and the fertile soil of tropics harbours these agents. Farmers have been known to be the most exposed group of people in the tropical and sub-tropical areas because of their occupation[4,10].

Infections from hookworm have been noted to clinically manifest as anaemia in patients. Some studies have shown that hookworm infected patients are more anaemic than those not infected by the nematodes[11]. The 54th World Health Assembly (WHA) in 2001 encouraged member states to ensure that anthelmintic drugs are administered to at least 75% and up to 100% of all school-aged children at risk of morbidity due to STHs infections by 2010[1-3] – this ambitiously achievable feat appears not include an equally at risk group of rural farmers especially in Sub-Saharan Africa.

Parasitic worms have continued to thrive in the tropics and especially Nigeria where a higher prevalence has been recorded due to poor environmental hygiene, inadequate water supply and very poor sanitation[12-14]. It has been reported that the habits of a population play a role in the prevalence of Helminth infection - many farmers in rural areas are indigent and poorly educated so exhibit poor sanitary practices. The warm and humid climate in tropical countries like Nigeria is also implicated in the region's high prevalence of the STHs. Farmers especially in rural areas may not be aware of the hazards and risks the burden of this disease portends[15,16]. Ukwa West Local Government Area of Abia State Nigeria is a typical rural agrarian setting with hardly any functional environmental health / sanitary system. This study was to determine the prevalence of STHs infections among farmers in Ukwa West LGA of Abia State, South East Nigeria.

## MATERIALS AND METHODS

Study area and study population: Ukwa South Local Government (LGA) is one the 17 LGAs of Abia State. Typically agrarian with a population of 88,555 from the 2006 census, the LGA also host a major international oil company. The climate is tropical with average daily maximum and minimum temperatures of $28^0$C and $23^0$C respectively. Ukwa West has an average rainfall of about 2400 mm with dry and rainy seasons in the year. They are mainly Christians with a few practicing African Traditional Religion and speak the Igbo language.

Study design and sampling: This was descriptive cross sectional study conducted in August 2015 with 290 consenting respondents (inclusive of margin for non-response) selected via multistage sampling. First, 8 out of the 16 wards of the LGA were selected by balloting followed by one community each balloted for from the 8 selected wards. Then 36 consenting farmers each who meet the inclusion criteria (18 years of age, farmers for at least a year and resident in the community) were again balloted for from the communities - although 37 respondents were selected from the last 2 two communities to make the 290.

Study population: There were about 1,500 registered farmers with an almost equal number of male and female members practicing essentially subsistence and quasi-commercial farming. Farming implements were hardly mechanized and most barely had formal education. Ages ranged from 20 to even 73 years! Most of them worked from early sunrise 6.30am to about noon Monday through Saturday every week in the peak of the planting season but this may be staggered as the season progressed till harvest.

Study instruments and sample collection: Sample collection was done between 2-4pm (to allow farmers return from the day's work) daily in their homes for one week. Under the supervision of the researchers, two trained assistants administered close ended, structured, interview-administered *questionnaire* which had been pre-tested among traders who came to the farm to buy the produce for onward sale at the major markets. The questionnaires probed respondents' socio-demographics, knowledge, attitude and practice towards STHs and were retrieved on the spot. *Stool samples for microscopy* were collected in properly labeled wide- mouth transparent specimen containers. The containers were given to the participants after the questionnaire session. There were specific verbal instructions to the participants on how to produce and handle the stool specimen to avoid contamination. Freshly voided stool sample was collected from every subject and preserved in 10 percent formalin. The samples were then transported to the laboratory where they were examined for ova of helminths. Diagnosis was based on identification of the characteristic helminth ova using standard characteristics17. Using Direct Smear method, an applicator stick was used to collect about 0.1 gram of the stool sample, placed on a clean non-grease microscopic slide. A drop of normal saline was added to it and emulsified properly. It was covered with a cover slip and examined under the microscope for intestinal helminth ova using 10X and 40X objectives microscope and findings recorded. Double slides were prepared for each sample to increase the accuracy of diagnosis. One slide was with normal saline and the other with iodine solution for clarity.

*Packed Cell Volume (PCV) using microhaematocrit reader* of the participants was estimated. Under aseptic

condition venous blood from the participant's brachial vein was collected into Ethylenediaminetetraacetic acid (EDTA) bottles. A plain capillary tube was three quarter filled with the blood and the unfilled end sealed with plasticine. The filled capillary was carefully located in one of the microhaematocrit rotor with the sealed end against the rim gasket to prevent breakage. This was centrifuged for 3-5 minutes (RCF 12 000-15 000xg). The PCV was read using a hand-held microhaematocrit reader. Anaemia was set at less than or equal to 20 % PCV.

*Walk through Survey* was carried out which included description of the farm sites, identification and classification of hazards, risk assessment and conclusion.

Data Analysis
The data were entered and edited using the Statistical package Epi-info program (Version 6.04d). The data were presented using descriptive statistical tools like tables and chart.

Ethical considerations: Ethical clearance was obtained from the Research Ethics Committee of the University of Port Harcourt. A signed permission for the conduct this study was also obtained from the Ukwa West LGA Health authorities. This was sent for endorsement by the Director of Public Health Services, Abia State. Consent was sought for and obtained from the Farmers' Association of the LGA. Also, endorsed informed consent was also obtained from respondents prior to commencement of the study. A session on health education for the prevention of STHs and the use of PPEs was carried out for the respondents.

Limitations: The difficulty in getting farmers to give their blood and stool samples for the analysis because of their superstitious beliefs was managed by reassuring respondents that it was an academic exercise that could come up with findings that will help them work safe and healthy. The language barrier was overcome by an interpreter.

Conflict of interest: None to declare

RESULTS
TABLE 1: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

| **Variables** | **Frequency (n)** | **Percentage (%)** |
|---|---|---|
| **Age** | | |
| **20-29** | 11 | 3.8 |
| **30-39** | 64 | 22.1 |
| **40-49** | 98 | 33.8 |
| **50-59** | 97 | 33.5 |
| **60-69** | 20 | 6.8 |
| ***TOTAL*** | ***290*** | ***100.0*** |
| **SEX** | | |
| **Male** | 98 | 33.8 |
| **Female** | 192 | 66.2 |
| ***TOTAL*** | ***290*** | ***100.0*** |
| **EDUCATION** | | |
| **Primary** | 111 | 38.3 |
| **Secondary** | 136 | 46.9 |
| **Tertiary** | 4 | 1.4 |
| **None** | 39 | 13.4 |
| ***TOTAL*** | ***290*** | ***100.0*** |

| | | |
|---|---|---|
| **MARITAL STATUS** | | |
| **Single** | 22 | 7.6 |
| **Married** | 199 | 68.6 |
| **Divorced** | 4 | 1.4 |
| **Widowed** | 65 | 22.4 |
| ***TOTAL*** | ***290*** | ***100.0*** |
| **RELIGION** | | |
| **Christian** | 284 | 97.9 |
| **Traditional African Religion** | 6 | 2.1 |
| **Islam** | 0 | 0.0 |
| ***TOTAL*** | ***290*** | ***100.0*** |

TABLE 2: PREVALENCE OF HELMINTH & ANAEMIA AMONG RESPONDENTS

| Characteristics | Freq (n) | Perc (%) |
|---|---|---|
| **PRESENCE OF HELMINTH INFESTATION** | | |
| **Yes** | 96 | 33.1 |
| **No** | 194 | 66.9 |
| ***TOTAL*** | ***290*** | ***100.0*** |
| **PRESENCE OF ANAEMIA** | | |
| **Yes** | 196 | 67.6 |
| **No** | 94 | 32.4 |
| ***TOTAL*** | ***290*** | ***100.0*** |

TABLE 3: TYPES OF HELMINTHS AMONG RESPONDENTS

| Characteristics | Freq.(n) | Perc.(%) |
|---|---|---|
| **HELMINTHS AMONG RESPONDENTS** | | |
| ***Ascaris lumbricoides*** | 22 | 20.2 |
| **Hookworm** | 65 | 59.6 |
| ***Strongyloides stercoralis*** | 6 | 5.5 |
| ***Trichuris trichuria*** | 16 | 14.7 |
| ***TOTAL*** | ***109**** | ***100.0*** |
| **NO. OF WORMS IN RESPONDENTS** | | |
| **One** | 84 | 87.5 |
| **Two** | 11 | 11.5 |
| **Three** | 1 | 1.0 |
| ***TOTAL*** | ***96*** | ***100.0*** |

*This is the number of respondents with STHs infection from where the breakdown of the types are represented

TABLE 4: RESPONDENTS KNOWLEDGE OF HELMINTH INFESTATION

| VARIABLES | FREQ (N) | PERC. (%) |
|---|---|---|
| **DO YOU KNOW THERE IS A DISEASE LIKE WORM INFECTION?** | | |
| **Yes** | 290 | 100.0 |
| **No** | 0 | 0.0 |
| ***TOTAL*** | ***290*** | ***100.0*** |
| **SOURCE OF INFORMATION** | | |
| **Radio** | 75 | 25.9 |
| **TV** | 26 | 9.0 |
| **Newspaper** | 5 | 1.7 |
| **Church** | 43 | 14.8 |
| **Family and friend** | 138 | 47.6 |
| **School** | 3 | 1.0 |
| ***TOTAL*** | ***290*** | ***100.0*** |
| **WHAT CAUSES WORM INFESTATION?** | | |
| **Evil spirits** | 4 | 1.4 |
| **Witches and Wizards** | 1 | 0.3 |
| **Wicked neighbours** | 0 | 0.0 |
| **Drinking contaminated water** | 63 | 21.7 |
| **Eating contaminated food** | 113 | 39.0 |
| **Eating contaminated fruits** | 44 | 15.2 |
| **I do not know** | 65 | 22.4 |
| ***TOTAL*** | ***290*** | ***100.0*** |
| **DO YOU THINK THAT WORM CAN PENETRATE THE FOOT INTO THE BODY DURING FARMING?** | | |
| **YES** | 74 | 25.5 |
| **NO** | 214 | 73.8 |
| **I DO NOT KNOW** | 2 | 0.7 |
| ***TOTAL*** | ***290*** | ***100.0*** |
| **DO YOU THINK THE WEARING OF SHOES CAN PROTECT YOU AGAINST WORM INFECTION?** | | |
| **Yes** | 67 | 23.1 |
| **No** | 73 | 25.2 |
| **I do not know** | 150 | 51.7 |
| ***TOTAL*** | ***290*** | ***100.0*** |

TABLE 5: RESPONDENTS' BEHAVIOUR TOWARDS HELMINTH INFESTATION

| Variables | Freq(n) | Perc. (%) |
|---|---|---|
| **What is your source of drinking water?** | | |
| Public pipe borne water only | 1 | 0.3 |
| Private water borehole only | 271 | 93.5 |
| Well water only | 17 | 5.9 |
| River water only | 1 | 0.3 |
| ***TOTAL*** | ***290*** | ***100.0*** |
| **Where do you defaecate?** | | |
| latrines | 235 | 81.0 |
| Open air | 0 | 0.0 |
| Bush near the house or farm land | 55 | 19.0 |
| Into the nearby water or river | 0 | 0.0 |
| ***TOTAL*** | ***290*** | ***100.0*** |
| **Do you wear shoes or foot wear while farming** | | |
| Yes | 73 | 25.2 |
| No | 217 | 74.8 |
| ***TOTAL*** | ***290*** | ***100.0*** |
| **Do you wear hand gloves during farming**? | | |
| Yes | 44 | 15.2 |
| No | 246 | 84.8 |
| ***TOTAL*** | ***290*** | ***100.0*** |
| **Do you use faeces (animal/human) as a source of manure/fertilizer?** | | |
| Yes | 243 | 83.8 |
| No | 47 | 16.2 |
| ***TOTAL*** | ***290*** | ***100.0*** |
| **Have you ever dewormed yourself** | | |
| **Never** | 33 | 11.4 |
| **Yes** | 253 | 87.2 |
| **Often** | 4 | 1.4 |
| ***TOTAL*** | ***290*** | ***100.0*** |

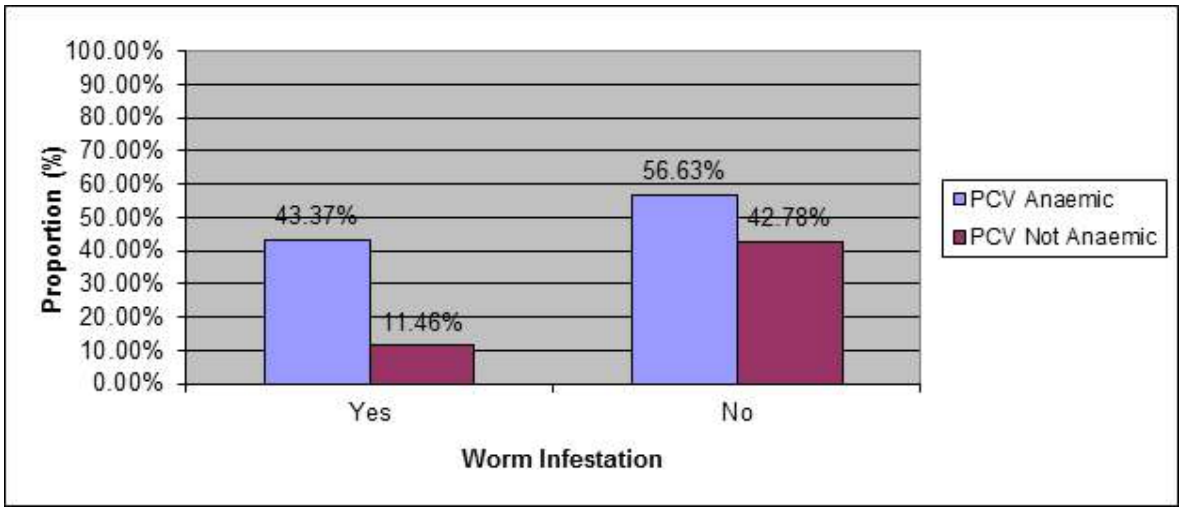


FIGURE 1: A bar chart showing respondents who had anaemia with STH infection and those with anaemia without STH infection

## SUMMARY OF RESULTS OF THE WALK THROUGH SURVEY OF THE FARMS

The farms were visited between 10am – 12noon in company of the farmers on the chosen days. Most of the farms were located away from the living area villages with very rough, bushy and poor access. The maximum number of farmers met working on any of the farms visited was six. The farmers here do both subsistence and commercial farming on mainly cassava, cocoyam, yams, vegetables, plantain, bananas, pumpkins, cucumber, etc.

Hazards generally noted on the farm environment included *biological hazards*: like snake bites, scorpion and bee stings, hookworm infestation, etc.; *chemical hazards* like exposure to agrochemicals like fertilizers, pesticides, herbicides and other chemical agents used to preserve crops and kill weeds; *physical hazards* which include weather elements like temperature. Others were *Mechanical hazards* like cuts on fingers, hands, face, legs and other body parts.

The use of personal protective equipment (PPE) was observed to be virtually non-existent. Farmers were seen handling farm instruments without hand gloves and walking about their farms with any foot wear.

Farming here was essentially by us of local manual farm implements with associated drudgery and risks. The work areas i.e. farms were riddled with hazards with their attendant associated risk.

## DISCUSSION

Soil Transmitted Helminths (STHs) is a major Public Health concern affecting over two billion persons in more than 100 countries. The infection is more prevalent in sub-Saharan Africa, China, India and South Americas. The disease burden is heaviest among the afore-mentioned countries most likely due to the low level of environmental hygiene, inadequate drainage system, and improper disposal of human waste and erratic, inadequate supply of safe portable water. The wet and humid soils in these regions enhance and encourage the thriving and survival of the ova of the helminths. Also, very common is the fact that most Nigerian work places including the farm have serious issues of the provision, use, enforcement and monitoring of PPEs.

The modal age group of respondents in the study was 40-49 years and underscores the young people of this area's apathy for farming - a high revenue earner. Younger adults rather prefer white collar office jobs the other. The current down turn in the price of crude oil - a major source revenue for Nigeria provides all an opportunity to go back to agriculture. Also, more women (66.2%) were into farming in Ukwa West than their male (33.8%) counterpart. This stems from culture where women's duties include farming to feed the home and subsistence farming. The rural urban flight of able bodied men who can and should do the job may also be a reason. With 13.5% of respondents' without any formal education – though not surprising, is serious red flag because this group is to know little or nothing about STHs, poor sanitary habits and poor (if any) use of PPEs while at work. These all form a recipe for STHs infection especially while at work farming.

From Table 2, there is 33.1% laboratory diagnosed worm infection literarily working out to 1 in 3 farmers with the STHs. This is quite high and disturbing considering the fact that it is a preventable and treatable disease. This is also in agreement with the

earlier studies on the prevalence of STHs.[6,18] Anaemia is rightly a direct consequence of hookworm infection and so not surprising that there was 67.6% prevalence among respondents. This also worrisome as anaemia Xmay be chronic and respondents were not even aware of it. Hookworm is a biological hazard common among farmers and due to its penetrative ability farmers who work without basic PPEs like boots, gloves and cover all are at exceptionally high risk of contracting the disease[19]. Table 3 makes it more evident as 59.6% of the farmers studied had hookworm. This also agrees with the study in Vietnam but with a twist where there was a high 61% *A.lumbricoides* especially among child farmers – child / slave labour remains an issue in that part of the world[20].

Knowledge (Table 4) of SHTs was at an all-time high (100%) among respondents and so knowledge about the existence of the disease was not the problem. Sources of information like family / friends (47.6%) and the radio (25.9%) appear to be the most viable means of reaching this study group. These need to be further explored and exploited while strengthening others like school, church and newspaper. Health education, provision and enforcement of use of PPEs were an important but scarce variable important among this group. This is because 73.8% of respondents did not know that the major route of entry of these helminthes was via penetration of the feet. Also, 51.7% of the respondents did not know that the use of foot wear could prevent STHs infection. This is indeed was a big call for concern and if stopped or reduced will go a long way in the control of STHs infection among the farmers.

Potable water, a major pillar of Primary Health Care was a big challenge in rural Ukwa East LGA, it was therefore not surprising 93.5% of respondents got their drinking water from unregulated privately sunk boreholes whose 'potability' and quality may be questionable. Table 5 showed that 19% of farmers passed faeces near their farm or house thereby completing and indeed sustaining the cycle of infection. The tropical environment, occupation of the respondents, soil type, sanitation facilities and their general attitude (i.e. hygiene practices and the use of human and livestock excreta as fertilizer / manure) may have contributed to the frequency and distribution of STHs[10,13,21]

As high as 74.8% of farmers did not use foot wear during farming just as 84.8% did not wear hand gloves. There was very poor use of these basic PPEs that would have gone a long way in the prevention of the disease. This was further compounded by the fact that 83.8% of respondents used feaces animal and human as source of manure. Poor hygiene and environmental sanitation are a major risk factor for the acquisition of STHs.. Excreta use in agriculture is widespread in rural communities. Studies have shown that sanitation is associated with a reduced risk of transmission of helminthiasis to humans[10,21]

Figure 1 is a bar chart showing proportion of respondents who had STHs infection with associated anaemia and those who had anemia without STHs infection. Participants with STHs who came down with anaemia were more in number – again upholding the strong relationship between STHs infection and anaemia. Findings from the walk through surveys indicated there were other concomitant hazards that may accentuaute STHs or even perpetuate other diseases that are not necessarily the subject of study presently. Like most situations associated with poverty, Third World countries carry the major burden of STHs infection. China, the most populous country in the world, has the highest absolute prevalence rate. The common feature among these nematodes is the intimate association of their reproductive cycles with wet soil and humid tropical climate in which the ova can thrive and survive for a long time. Human interaction with the contaminated soil through daily activity including occupational as seen among farmers exposes him to the infection. Poverty, ignorance, poor environmental sanitation etc. enhance the spread of STHs. In other words, poor habits and poor protection (PPE) synergize to perpetrate the endemicity of STHs in the third world countries.

## CONCLUSION

There was helminth infection with attendant anaemia among farmers in Ukwa West Local Government Area of Abia State. This was occasioned by poor use of PPEs in work place and environmental sanitation. There is need for an objective control program for helminthiasis (STH) amongst these farmers to be implemented, monitored and enforced by the Extension Workers in the LGA. This programme should include health education, proper sanitation and use of basic PPEs by the farmers while at work.

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