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Helminthic Infections among Farmers in a Rural Community in Oyo State, South-Western Nigeria

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KEYWORDS

Farmers, Helminthic infections, Rural community, South-western, Nigeria

ABSTRACT

BACKGROUND

Helminthic infections are occupationally-related diseases which potentially undermine farmers' work capacity, productivity and life expectancy. These infections are usually under-reported among this group particularly in the rural areas. This study was carried out to determine the prevalence, pattern and factors associated with helminthic infections among farmers in a rural community in Oyo State, South-western Nigeria.

METHODOLOGY

A cross-sectional study was conducted among 400 farmers, selected by a two-stage cluster sampling technique. A structured interviewer-administered questionnaire was used to obtain information on respondents' demographic characteristics and farming activities. Stool was examined using microscopy for ova of helminths and Packed Cell Volume (PCV) was determined with anaemia defined as PCV ≤ 30%. Frequencies were generated and Chi-square test was used to determine associations at the level of $p \leq 0.05$.

RESULTS

Majority of the respondents (71%) were males, aged ≥50 years (67.9%), of Yoruba ethnicity (94.2%), and had no formal education (69.8%). Most respondents (57.0%) were engaged in subsistence farming and 75.8% produced food crops. The prevalence of helminthic infections was 27.9%: the commonest forms were ascaris (68%) and hookworm (29.9%). Co-infections were found in 7.2% respondents with the most frequent combination being ascaris and hookworm. Twenty six (6.5%) of the farmers had anaemia. Significantly higher proportions of those aged ≥60 years and without education had intestinal helminthic infections and higher proportions of those with helminthic infections had anaemia compared with their respective counterparts ($p<0.05$).

CONCLUSION

Helminthic infection is prevalent among this population. Interventions targeted at prevention and treatment should be implemented.

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INTRODUCTION

Helminths are parasitic worm infections which are quite common in human populations. These infections are of major public health concern in sub-Saharan Africa because of existing predisposing factors in the region. These factors include poor environmental and personal hygiene, poverty, malnutrition, unsafe water supply and ignorance. [1,2] It is estimated that approximately one-third of the almost three billion people living on less than two US dollars per day in developing regions of sub-Saharan Africa, Asia, and the Americas are infected with one or more helminth.[3,4] Practically speaking, this means that the inhabitants of thousands of rural, impoverished villages throughout the tropics and subtropics are often chronically infected with several different species of

parasitic worm.[5] The vulnerable groups who are at the highest risk of morbidity are pre-school and school-age children, pregnant women6 and farmers. Though, several studies on helminthic infections have been conducted among pregnant women, the pre-school and school-age groups there are few of such studies on farmers.[7,8,9,10]

Farmers suffer from a host of diseases and other health related problems due to poverty and lack of organized occupational health policies.[11,12] Compared to workers in other sectors, farmers are under-protected and they suffer higher rates of complications from preventable diseases including helminthiasis. The most vulnerable groups are workers in subsistence agriculture, daily labourers in farms or plantation, seasonal or migrant workers, women and child labourers. The majority of population in Nigeria and Africa are engaged in small scale subsistence farming. The environment farmers live in, their standard of living and nutrition are very important to their health. These farmers have problems of poor housing, personal and environmental hygiene and inadequate diet, thus predisposing them to general and occupationally related diseases.[11] Socio-economic, cultural and environmental factors also influence the working and living conditions of farmers. Most of these farmers reside in the rural areas where the major occupation in Africa, including Nigeria is farming.[7] According to NDHS, [13] about two thirds of the Nigerian population resides in rural areas and one third in urban. The majority of these populations are engaged in small-scale subsistence farming.[8,14]

Helminth infections are major biological hazard of the rural farmers. Poor personal hygiene and sanitation such as indiscriminate open defecation due to lack of toilet facilities also predispose to these infections. Helminth infections like ascaris and hookworm could lead to malnutrition and anaemia.[15, 16] This complication may result from late detection of these infections due to lack of access and poor utilization of health services especially in the rural areas. This could adversely undermine the work capacity, productivity and life expectancy of this geographically disadvantaged group. Generally, it is either such infections are not reported or they are under-reported among farmers in the rural areas. Therefore, understanding the magnitude and factors associated with helminthic infections among rural farmers in Nigeria could inform cost effective interventions such as location-specific environmental sanitation and deworming programme among this deprived group who may not be able to constitute a trade union and have access to occupational health services. Therefore, this study was carried out to determine the prevalence, pattern and factors associated with helminthic infections among farmers in a rural community in Oyo State, south-western Nigeria.

METHODOLOGY

The study was conducted in Otu, a rural community located in Itesiwaju Local Government Area (LGA) of Oyo State in the southwestern part of Nigeria. It is made up of three clans as separate communities, which are Iwoye, Ibise and Ilesan. The projected population of Otu using 2006 population census[17] was 18,981 assuming an annual growth rate of 3.2%. Of these, 9,303 constitute the adult

population. The majority of the inhabitants are predominantly Yoruba and the major occupation practiced by the residents is subsistence farming. However, some of the people combined artisanship with farming.

A cross-sectional survey was conducted among 400 adult farmers who were 20 years of age and above to assess the prevalence, pattern and determinants of helminthic infections. A two- stage cluster sampling technique was used to select respondents based on the listing all the compounds in each of the three clans. Initially, 10 compounds each were selected by simple random sampling technique from each clan then 10 households were further selected by simple random sampling technique from each compound. These selected households constituted clusters. A structured pretested interviewer-administered questionnaire was used to obtain information on respondents' demographic characteristics and farming activities.

The instrument was pretested in a neighbouring community which was not selected for the main study. Samples of stool and blood were collected for stool microscopy and Packed Cell Volume (PCV) estimation respectively. Stool microscopy samples were collected with labelled universal bottles which were provided to each respondent using the corresponding identification number on their questionnaire. Each stool sample was examined using the direct faecal smear and brine concentration method which involved placing a coverslip on the brine (faecal sample suspension) for three to five minutes.18 The worm species were then identified through their eggs (ova) using light microscopy. A total of 348 farmers submitted stool sample for laboratory investigation of helminth infection. The prevalence of helminth infection was estimated as the proportion of farmers with abnormal stool microscopy which was defined as presence of at least a helminth ova in a stool sample

Blood samples for PCV estimation were collected by puncturing the tip of the respondents' thumbs with sterile lancet after cleaning with cotton wool soaked in spirit. A capillary tube was used to collect the blood and the end through which samples were collected plugged with plastacene and carefully transported to the laboratory for spinning. PCV was estimated using a haematocrit reader. Anaemia was defined as PCV ≤30%.Frequencies were generated and Chi-square test was used to determine associations at 5% level of significance.

RESULTS

Four hundred farmers were approached and they all consented to participate in the study. Majority 284 (71%) were males with a M:F ratio of 2.5:1. Majority, 172 (67.9%) were aged 50 years and above. Almost all, 377 (94.2%) were of Yoruba ethnicity and 341(85.3%) were currently married (Table I).

Majority, 279 (69.8%) had no formal education. Slightly over half,228 (57.0%) were subsistence (small scale) farmers and 303 (75.8%) produced food crops such as cassava, yam and maize.Most, 276 (69%) of the respondents combined other occupations with farming. The commonest secondary occupations engaged in by the farmers were artisanship (48.6%) and trading (40.9%). The average monthly income of 289 (72.2%) of the farmers was less than N7,500 (Table II).

Table I: Socio-demographic characteristics of respondents (N=400)

Variables	Frequency (n)	Percentage (%)
Sex		
Male	284	71
Female	116	29
Age range (years)		
≤ 39	48	12.2
40 - 49	80	19.9
≥ 50	272	67.9
Ethnic group		
Yoruba	364	91.0
Igbo	36	9.0
Marital status		
Currently married	341	85.3
Single	14	3.5
Separated/cohabiting	22	5.5
No response	23	5.8
Family type		
Monogamous	225	66.0
Polygamous	116	34.0

Table II: Distribution of respondents by occupational characteristics (N=400)

Variables	Frequency n (%)
Type of farming	
Small scale	228 (57.0)
Medium scale	167 (41.8)
Large scale	5 (1.2)
Secondary occupation	
Yes	276 (69.0)
No	124 (31.0)
Type of secondary occupation (N=276)	
Artisans	134 (48.6)
Trading	113 (40.9)
Teaching	8 (2.9)
Others	21 (7.6)
Type of crop produced	
Food crop only	303 (75.8)
Cash crop only	7 (1.7)
Both	90 (22.5)
Average monthly income (₦)	
< 7500	289 (72.2)
7500–9999	96 (24.0)
⩾ 10000	15 (3.8)

Table III: Distribution of respondents by prevalence and pattern of helminths (N = 348)

Prevalence and pattern	Frequency n (%)
Stool microscopy	
Normal	251 (72.1)
Abnormal	97 (27.9)*
Parameters (N = 104)	
Ascaris ova	66 (68.0)
Hookworm ova	29 (29.9)
Taenia ova	3 (3.1)
Trichuris ova	3 (3.1)
Shistosoma ova	3 (3.1)
Type of infection (N = 97)	
Single infection	90 (92.8)
Double infection	7 (7.2)
Double (Co-) infection (N = 7)	
Ascaris and hookworm	4 (57.1)
Ascaris and shistosomiasis	2 (28.6)
Trichuris and hookworm	1 (14.3)

***Prevalence of helminths**

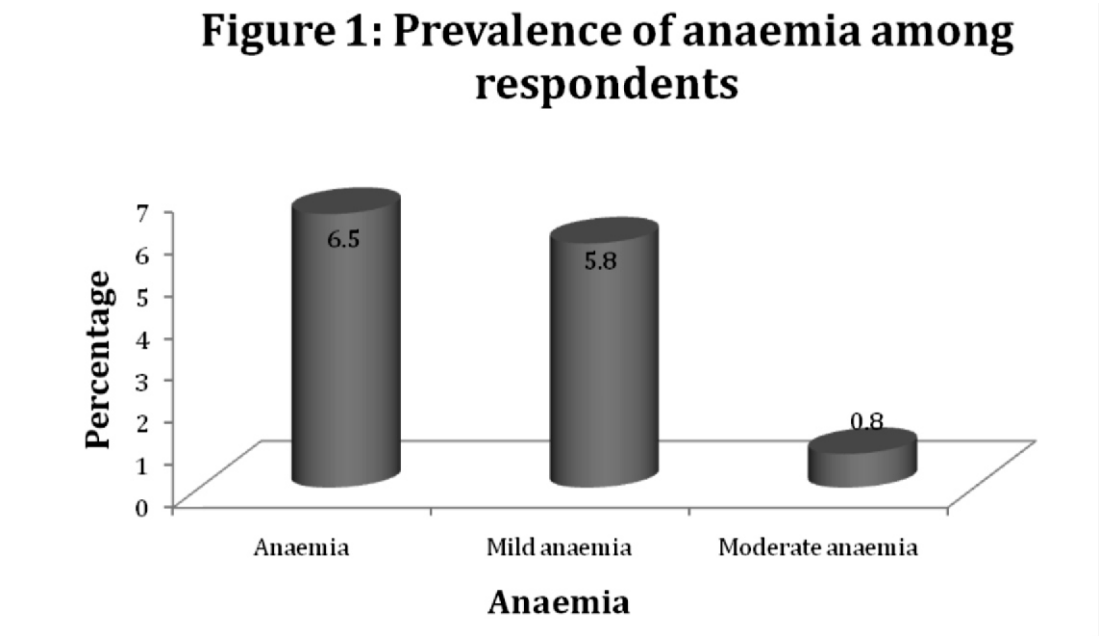

Table IV: Association between respondents' socio-demographic characteristics and worm infestation

Variables	Positive ova in stool		Chi square	p-value
	Yes n (%)	No n (%)		
Age group				
< 40	10 (23.8)	32 (76.2)	6.482	0.039*
40 -59	31 (21.7)	112 (78.3)		
60 and above	56 (34.4)	107 (65.6)		
Sex				
Male	67 (28.2)	171 (71.8)	0.029	0.898
Female	30 (27.3)	80 (72.2)		
Level of education				
None	79 (32.0)	168 (68.0)	7.152	0.008*
Some	18 (17.8)	83 (82.2)		
Income level				
< ₦7500	68 (27.0)	184 (73.0)	0.359	0.593
₦7500 and above	29 (30.2)	67 (69.8)		

Regarding current substance use among the farmers, 170 (42.5%) reported they had drunk alcohol in the 30 days period prior to the study while 73 (20.8%) smoked cigarette and chew tobacco. Three hundred and forty eight farmers (87.0%) submitted stool sample for microscopy. The prevalence of helminthic infections among farmers was 27.9%. Ascaris (68%) was the commonest type followed by hookworm (29.9%).

Among those with abnormal stool findings, co-infections were found in 7.2% with ascaris and hookworm (57.1%) accounting for the commonest combination (Table III). Only 26 (6.5%) of the farmers had PCV < 30% (Figure 1).

On bivariate analysis, higher proportions of those aged ≥60 years (34.4%) and those who were not educated (32.0%) had helminthic infections compared with those aged < 40 (23.8%) and 40-59 (21.7%) [p=0.04] and 17.8% of those that had some education (p=0.008) respectively (Table IV). Significantly higher proportions of the elderly farmers (p=0.02), female (p=0.01), without formal education (p=0.03) and with helminthic infection (<0.0001) had anaemia compared with their respective counterparts.

DISCUSSION

This study assessed the prevalence and pattern of helminthic infections among adult rural farmers and factors relating to them in Otu, a predominantly Yoruba rural community in Oyo state, Nigeria. The farmers in this community were mostly elderly as about half of them were aged 60 years and above. Though FAO19 reported that women contribute about 80% of food production in Africa and 60% in Asia, but in this study there were more male participants compared to female. About two-thirds of these farmers had no formal education and were mainly in monogamous family settings. More than half engaged in small-scale farming and

they mostly produced traditional food crops. This might account for the poverty level reported in this study as 72.2% of them earned less than N7,500 per month which translates to $1.70 per day. These findings agreed with the reports of other studies.[20, 21, 22,23,24] These studies documented that most African farmers were quite poor because they practised small-scale farming and lacked the innovative tendencies to take short cut in production. Poverty remains a widespread social phenomenon in the developing country as more than half of the population live on less than $2 (N300) per day.[22]

In this study, about 30% of the respondents had at least one ova of a helminth. This finding is lower than the prevelance of 37% reported by Anosike et al[25] in a study conducted among farmers in eastern Nigerian and the 69% reported by Onadeko et al[26] in four rural villages in Ogun State. The lower prevalence reported in this study might be a reflection of improved awareness of control strategies like health education and sanitation since it is a more recent study than that of Anosike et al[25] and Onadeko et al26. However, a prevalence of 30% qualifies farmers in this study area as ''at risk group''[27]. The WHO recommends periodic drug treatment (deworming) without previous individual diagnosis to all at-risk population such that treatment should be given once a year when the prevalence of soil-transmitted helminth infections in the community is over 20%, and twice a year when the prevalence of soil-transmitted helminth infections in the community is over 50%[27].

The commonest single helminthic infection among farmers in this study location was ascaris, followed by hookworm. Others include taenia, trichuris and schistosomiasis of 3.1% prevalence each. Similar finding was reported by Agbolade et al[28] in a study conducted among rural communities in South-western Nigeria where ascaris and hookworm were the most prevalent single helminths even though the prevalence of hookworm was lower than what was obtained in this study. However, hookworm was the most prevalent single parasitic worm in the study conducted by Anosike et al.[25] Most studies reported ascaris and hookworm as the commonest mixed infection, [28] followed by ascaris and trichuria.[26] The predominant prevalence of ascaris, either as a single infection or mixed, may be due to the direct mode of infection and the high resistance of the infective ova to desiccation which enhances longevity and promotes infectivity. On the other hand, the high prevalence of hookworm might be accounted by rural farmers' primitive practice of walking bare-footed on contaminated grounds. Age and educational level were significantly associated with helminthic infections while sex, age, educational level and helminthic infection were significantly associated with anaemia. The study revealed that the prevalence of helminthic infections was higher among older farmers aged 60 years and above compared with the younger age groups. This might be attributable to increased vulnerability to infections with aging process due to waning immunity especially in a group like our study population that works till advanced age (without a standard retirement age) in the face of other health-related challenges related to aging. The waning immunity can be complicated by poor nutritional and environmental factors which are common in agrarian communities.[1,2] It is also important to

note that long duration of work-related exposure to helminthic infection can account for the higher prevalence reported among the older farmers. The prevalence of intestinal helminthic infections were more among those who were not educated than those with some form of education. Rural communities often lack education and information on the health hazard they face. Majority of farmers in developing countries are illiterates without even a primary school education and this contributes immensely to their exposure to various health challenges. Education is therefore said to improve farm yield by at least 24% as it would improve their knowledge of health and general well-being among other benefits.[29]

The prevalence of helminthic infections among these rural farmers did not show sex preponderance which was consistent with the finding by Anosike et al.[25] Our study further revealed that higher proportion of farmers that were females, elderly, without formal education and with helminthic infections were found to be more anaemic. These findings were consistent with the reports of Chowdhury et al[30] in a study conducted to determine the prevalence of anaemia and intestinal parasitosis in a rural agricultural community of Fullbariathana, Mymensingh district in Bangladesh. However, monthly menstruation which was not accounted for in this study could have been responsible for the higher prevalence of anaemia among females than males. The higher poverty level though not significant for helminthiasis and anaemia, and higher illiteracy rate among farmers in this community might precipitate malnutrition and other infections like malaria which were not considered in this study.

CONCLUSION AND RECOMMENDATIONS

One out three of these rural farmers had helminthic infections and ascariasis was the most prevalent as a single infection and double infection with hookworm. Factors associated with Worm infections were illiteracy and older age i.e.≥ 60 years. Some of the farmers also had clinical anaemia particularly the older age, those who had no formal education and had helminthic infestations. Interventions targeted at prevention and treatment should be implemented in this at risk population. Promotion of health among rural farmers will require continuous health education intervention. This could be organised as a collaborative efforts among the Ministries of Agriculture, Health and Education. Use of mass deworming exercise in rural communities will equally serve as an effective interventional treatment strategy. Further research related to the health and safety of farmers is strongly recommended for this under-represented group.

REFERENCES

1. Ijagbone IF, Olagunju TF. Intestinal helminth parasites among school children in Iragbiji, Boripe Local Government Area, Osun State, Nigeria. Afr. J. Biomed. Res.2006; 9: 63-66.

2. Cairncross S, Bartram J, Cumming O, Brocklehurst C: Hygiene, sanitation, and water: what needs to be done? PLoS Med 2010, 7:e1000365.

3. Hotez PJ et al. Incorporating a rapid-impact package for neglected tropical diseases with programs for HIV/AIDS,

tuberculosis, and malaria. PLoS Med. 2006;3:e102.

4. Hotez PJ et al. Control of neglected tropical diseases.N. Engl. J. Med. 2007;357:1018–1027.

5. Hotez PJ, Brindley PJ, Bethony JM, King CH, Pearce EJ, Jacobson J: Helminth infections: the great neglected tropical diseases. J Clin Invest 2008, 118:1311-1321.

6. Bethony J, Brooker S, Albonico M, Geiger SM, Loukas A, Diemert D, Hotez PJ: Soil-transmitted helminth infections: ascariasis, trichuriasis, and hookworm. Lancet 2006; 367: 1521-1532.

7. International Fund For Agricultural Development (IFAD). Rural poverty in Nigeria. In rural poverty portal 2008. Italy.

8. World Bank. 2005. Nigeria: Health, nutrition and population country status report. Volume II Main Report. Washington D.C: World Bank.

9. Matthys B, Bobieva M, Karimova G et al. Prevalence and risk factors of helminths and intestinal protozoa infections among children from primary schools in western Tajikistan. Parasit Vectors 2011; 4: 195. Published online 2011 October 7. doi: 10.1186/1756-3305-4-195

10. Dabo A, Badawi HM, Bary B, Doumbo OK. Urinary schistosomiasis among preschool-aged children in Sahelian rural communities in Mali. Parasit Vectors 2011; 4: 21..

11. ILO. Safety and health in agriculture injury and mortality in non-chemical accidents. 88th session, 30th May-14th June, 2000.

12. Asuzu MC. Occupational health. A summary introduction and outline of principles. Published by Afrka-Link Books, Ibadan; 2010: 1-35.

13. National Population Commission (NPC) [Nigeria] and ICF Macro. 2009. Nigeria Demographic and Health Survey2008. Abuja, Nigeria: National Population Commission and ICF Macro.

14. UNICEF. Children's and women's right in Nigeria: A wake-up call; situation assessment analysis, Nigeria 2001.

15. Hotez PJ, Brooker S, Benthony JM, Bottazzi ME, Loukas A, Xiao S. Current Concepts: Hookworm infection. New England Journal of Medicine 2004; 351: 799-807.

16. Gia NT, Srirat L, Nantaporn P. Factors related to hookworm infection among farmers in Phu Xuan sub district, PhuVang district, ThuaThien Hue Pronvince, Vietmam. The Public Health Journal of Burapha University 2013; 8 (2): 107-111.

17. National Population Commission (NPC). Nigerian Population Facts and Figures. Available at: http:// on March 16, 2014).

18. WHO. Infectious diseases 1991.

19. FAO. Globalization of food system:

Impact on food security and nutrition 2004: Pg 83.

20. Thiesenhusen WC. Have agricultural economists neglected poverty issues? Pak Dev Rev 1991; 30: 551-572.

21. Gyapong JO, Gyapong M, Evans DB, Aikins MK, Adjei S. 1996.The economic burden of lymphatic filariasis in northern Ghana.Ann Trop med Parasitol 1996; 90: 39-48.

22. ILO. Agriculture, plantations and other rural sectors. Social Dialogue 2004.

23. FAO. Nutritional food security, hygiene as sanitation conditions in the fishing community of Limbe, Cameroon 2005.

24. Olaitan MO. Development Finance Department, Central Bank of Nigeria.Poverty reduction through microfinancing. Nigerian tribune newspaper. May 1, 2007.

25. Anosike JZ, Adeiyongo CM, Abanobil OC et al. Studies on the intestinal worms (helminthiasis) infestation in a Central Nigerian Rural Community. J. Appl. Environ. Mgt. 2006; 10: 61-66.

26. Onadeko MO, Ladipo OA. Intestinal parasite infestation in rural communities: a focus for primary health care in Nigeria. Afr J Med Sci 1989; 18: 289-94.

27. WHO (2014). Fact sheet no 366. Available online at http;//www.who.int/wormcontrol. Accessed December 10, 2014.

28. Agbolade OM, Akinboye DO, Awolaja A. Intestinal helminthiasis and urinary shistosomiasis in some villages in Ijedu North, Ogun State, Nigeria.African Journal of Biotechnology 2003; 3: 206-209.

29. ICA. "Poverty is Everybody's Business: Education and Training is Key for Poverty Eradication" In World Rural Women's Day. Geneva 2002.

30. Chowdhury MA, Chowdhury SA, Ziauddin HS. Prevalence of anaemia and intestinal parasites in a rural community of Bangladesh. BRAC. Research monograph series1998: No 12.