

Predictors of soil-transmitted helminthic infection among pregnant women attending antenatal clinic at the Federal Medical Center, Abeokuta, Nigeria

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ABSTRACT

Introduction: Soil-transmitted helminth infection is a major contributor to anemia which is associated with morbidity and mortality during pregnancy in endemic regions like Nigeria. This study assessed the predictors of helminthic infections among pregnant women attending Antenatal clinics in the Federal Medical Center (FMC), Abeokuta, Ogun State.

Methodology: A cross-sectional study was conducted among pregnant women attending the Antenatal (ANC) of the Department of Obstetrics and Gynecology, FMC, Abeokuta. Systematic random sampling was used for selecting study participants and semi-structured self-administered questionnaire was employed for data collection. Stool samples were collected from the participants and formol-ether concentration technique was used for stool examination. Besides, eggs of helminths were identified and quantified. Data were analyzed using statistical package for social sciences (SPSS) version 22. Associations were tested using the Chi-square test. Predictors of helminths infection were determined using the logistic regression analysis. Level of significance was set at 5%.

Result: One hundred and seventy-four (174) women participated in the study. The mean age (SD) of the pregnant women was 30.44 (4.87) years. The majority (81.6%) had a tertiary level of education. The prevalence of intestinal helminth infection among the respondents was 21.8%. *Ascaris lumbricoides* (9.2%) was the most prevalent helminth, followed by hookworm infestation (7.5%) and *Trichuris trichuria* infestation (3.4%). The predictors for helminthic infestation among the respondents were aged 30 years and below (1.000; 0.23–1.20), pregnant women who had primary education and below (1.74; 0.72–3.06), and use of pit latrine and bush as waste disposal method (2.31; 0.86–6.21). Respondents who practiced handwash were less likely to have a helminthic infection (0.98; 0.11–9.08).

Conclusion: *Ascaris lumbricoides* is the most commonly found helminth among the study population. Low education and poor hygiene were significant risk factors for helminthic infection among pregnant women.

Key words: Antenatal clinic; helminthic infection; pregnancy.

Introduction

Soil-transmitted helminths (STH) have a worldwide geographic distribution and the greatest numbers are found in sub-Saharan Africa, the Americas, and Asia.^[1] They

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are among the prevalent neglected tropical diseases with over 4.5 billion people at risk and infecting over one billion people (24%).^[2-4]

Helminths are categorized into nematodes (roundworms) e.g. *Ascaris lumbricoides*, hookworms, *Trichuris trichiuria*; trematodes (flatworms), e.g. *Schistosoma* species; and cestodes (tapeworms), e.g. *Taenia solium*.^[5]

The prevalence and intensity of infection are especially high in developing countries, among populations with poor environmental sanitation. Hygienic practices such as handwashing, disposal of refuse, personal hygiene, and the wearing of shoes, when not done properly, may contribute to the infection or picking of infective forms of the worms from the environment.^[6,7]

STH infection causes both nutritional deficiencies and parasitic infection, which contribute most to anemia which could result from blood loss directly through ingestion and mechanical damage of the intestinal mucosa and indirectly, by affecting the supply of nutrients necessary for erythropoiesis resulting in anemia.^[8,9] Hookworm infections are recognized as the leading cause of pathologic blood loss in tropical and subtropical countries.^[10]

The burden of helminthic infection in girls and women especially during pregnancy has been reported to constitute a global burden of disease.^[11] The high rates of infection among pregnant women are mostly indicative of fecal pollution of soil and domestic water supply around homes due to poor sanitation and improper sewage disposal.^[12] Pregnant women are particularly vulnerable to infection. An estimated one-third of all pregnant women in developing countries have helminth infection, this amounts to about 44 million of the developing world's 124 million pregnant women.^[8,13]

Ndamukong in a study to determine the intestinal helminthic infections among pregnant Cameroonian women attending the clinic recorded a prevalence of 47.1%. A hospital-based study conducted in the South Eastern region of Nigeria by Egwunyenga *et al.*, recorded a prevalence of 48.3%.^[14,15]

Worm infection during pregnancy adversely affects the mother and the unborn child, causing neonatal prematurity, intrauterine growth restriction, and increased maternal and neonatal morbidity and mortality.^[16]

Research has documented that relatively light hookworm infections may decrease fetal growth and weight gain in pregnancy. Stunting may follow in childhood, then in

adulthood; in female children, this leads to shorter mothers, low pregnancy weight gain, greater chances of intrauterine growth restriction, and low birth weight babies.^[17]

Intestinal helminth is endemic in Nigeria and it continues to prevail because of the lack of health-promoting behaviors, poor environmental sanitation, and low level of living standards.^[18] It has been documented that susceptibility to helminth infestation has a genetic, immunological, sociocultural, and behavioral component.^[19] This study assessed the predictors of intestinal helminthic infection among pregnant women attending the Antenatal clinic at the Federal Medical Center, Abeokuta, Ogun State.

Methodology

Study area

The study was conducted at the Antenatal clinic (ANC) unit of the Department of Obstetrics and Gynecology, Federal Medical Center Abeokuta, Ogun State.

Study design

It was a cross-sectional hospital-based study and a part of a larger study.

Study population

The study population was pregnant women attending the ANC at FMC, Abeokuta from March 2017 to September 2017. One hundred and seventy-four (174) pregnant women selected by systematic random sampling technique participated in the study.

Stool sample collection

The study participants were provided with labeled screw capped, clean, leak-proof, and sterilized sample bottle containing Cary-Blair medium and informed on how to collect and bring small quantities of their stool specimen (5 g) in the morning of next antenatal clinic visit. Stool specimens were examined within 24 h of collection. Formol-ether concentration technique was used for stool examination.

A semi-structured pretested questionnaire was used to obtain information from participants. This questionnaire was divided into four sections:

Section A: Sociodemographic information, Age, religion, educational status, marital status, occupation, husband occupation, and average monthly income.

Section B: Obstetrics history; estimated gestational age, last menstrual period, expected date of delivery, and parity

Section C: Risk factors and hygiene; Type of house, source of water supply, type of sewage disposal, washing of hands, washing of fruits before eating, habit of handwashing after defecation, eating of soil during pregnancy (geophagy), and farming/farm practices

Section D: Laboratory results; stool microscopy.

Data management

Data obtained were entered into the computer and statistical analysis was done using statistical package for social sciences (SPSS) version 22. Study findings were presented in proportions, frequency tables, and charts. Qualitative variables were analyzed using Pearson's Chi-square and logistic regression analysis was done to show the predictors of helminthic infections among the participants. The level of significance was set at 5%.

The respondents' occupations were classified using the modified socioeconomic classification by British Registrar general's social class into four categories;

1. Professionals/managerial - Doctors, nurses, teachers, lecturers, clergymen, civil servants
2. Skilled non-manual - Tailors/fashion designer, petty traders, drivers/motorcyclists
3. Skilled manual - Bricklayers, carpenters, plumbers, welders, farmers, mechanics
4. Unskilled - Housewives, students including unemployed individual

The study protocol was approved by the Federal Medical Center Health Research Ethics Committee (HREC). Written informed consent was obtained from the participants after they had been adequately informed about the study.

Results

Respondent's sociodemographic information and obstetric history

One hundred and nine (62.6%) respondents were aged 28 to 37 years. The mean age \pm SD of pregnant women was 30.44 ± 4.87 years. Most of the respondents (71.8%) were Christians. The majority of them (81.6%) had a tertiary level of education. Less than half of them (43.7%) had a skilled nonmanual job (tailors/fashion designer, petty traders, drivers/motorcyclists). Slightly over one-fifth (26.4%) of them had an average monthly income of fewer than 18000 nairas per month [Table 1].

Table 2 showed that about half (50.1%) of the respondents were in their 3rd trimester and the majority (41.4%) were nulliparous women.

Prevalence and pattern of helminthic infection among respondents

Figure 1 showed the prevalence of soil helminths infection among the respondents. About 21.8% of the respondents had STH infection while 78.2% did not have.

Table 3 showed that 9.2% of the respondents had *Ascaris* infestation, 7.5% of the respondents had hookworm infestation, 3.4% had *Trichuris Trichuria* infestation, 1.1% had *Entamoeba Histolytica* infestation, and 0.6% had *Entamoeba coli* infestation.

Predictors of helminthic infections among the respondents

Nearly 94.8% of the respondents were living in a house with a corrugated roof. Most of the respondents (96.6%) reported regular handwashing. Respondents' reported waste disposal methods were: 81.6% used the water closet, 11.5% used the bush, 5.7% used the pit latrine, and 1.1% used the stream. The respondents' sources of drinking water were; around 35.6% of the respondents drank water from the pipe, 60.9% drank from sachet water, and 3.4% drank from the well. Respondents that reported the habit of eating soil were 2.9% and 5.2% reported the use of human feces as fertilizer which is shown in Table 4.

On logistic regression, respondents who were aged 30 years and below were more likely to have a helminthic infection as compared with respondents aged 30 years and above (AOR = 1.000; 95% CI = 0.234–1.202) $P < 0.05$. Pregnant women who had primary education were almost twice likely to have a helminthic infection than those with secondary education (AOR = 1.738; 95% CI = 0.719–3.056). Respondents who used pit latrine and bush as waste disposal method were more than twice likely to have a helminthic infection as compared with respondents that used water closet (AOR = 2.307; 95% CI = 0.857–6.213) $P < 0.05$. Respondents who practice handwash are less likely to

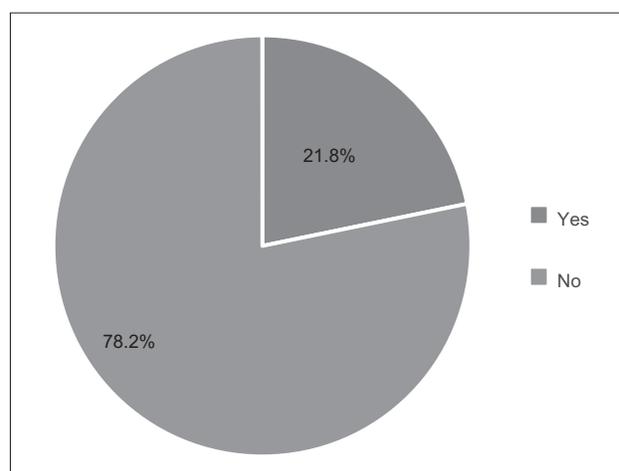


Figure 1: Prevalence of soil-transmitted helminths among the respondents

Table 1: Sociodemographic Information of respondents

Variables	n (%)
Age (years)	
18-27	52 (29.9)
28-37	109 (62.6)
38-47	13 (7.5)
Mean age (years)	30.44±4.87
Religion	
Christianity	125 (71.8)
Islam	49 (28.2)
Level of Education	
Primary Education	5 (2.9)
Secondary Education	27 (15.5)
Tertiary Education	142 (81.6)
Marital Status	
Single	7 (4.0)
Married	166 (95.4)
Separated/divorced/widowed	1 (0.6)
Occupation	
Professionals	61 (35.1)
Skilled nonmanual	76 (43.7)
Skilled manual	1 (0.6)
Unskilled	36 (20.7)
Husband's occupation	
Professionals	109 (63.0)
Skilled nonmanual	50 (28.9)
Skilled manual	13 (7.5)
Unskilled	1 (0.6)
Average monthly income	
≤18,000 naira	46 (26.4)
>18,000 naira	128 (73.6)

Table 2: Obstetric history of respondents

Variables	n (%)
Trimester	
1 st	18 (10.4)
2 nd	66 (37.9)
3 rd	90 (51.7)
Parity	
Nullipara	72 (41.4)
Primipara	50 (28.7)
Multipara	50 (28.7)
Grand multipara	2 (1.2)

have helminthic infection (AOR = 0.978; 95% CI = 0.106–9.080) $P < 0.05$ as shown in Table 5.

Discussion

Helminth infection is a serious public health issue especially among pregnant women and several factors such as immunological, personal hygiene, and environmental factor have been, have been known to contribute to the susceptibility of pregnant women to helminth infection. This study explored the predictors of helminth infections among the study population.

The prevalence of intestinal helminths among the study population was significant considering the peculiarity of the population and the effect of the infection on both

Table 3: Pattern of helminthic infection among respondents

Type of helminths	Cases n (%)
No helminths	136 (78.2)
Ascaris	16 (9.2)
Hookworm	13 (7.5)
<i>Trichuris trichura</i>	6 (3.4)
<i>Entamoeba histolytica</i>	2 (1.1)
<i>Entamoeba coli</i>	1 (0.6)
<i>Fasciola hepatica</i>	0 (0)

Table 4: Respondents' risk factors for intestinal helminth infection

Risk factors	n=174 (%)
Type of house roof sheet	
Corrugated	165 (94.8)
Thatched	9 (5.2)
Handwash	
Yes	168 (96.6)
No	6 (3.4)
Waste disposal	
Toilet/water closet	142 (81.6)
Bush	20 (11.5)
Pit latrine	10 (5.7)
Stream	2 (1.1)
Source of drinking water	
Pipe bore	62 (35.6)
Sachet	106 (60.9)
Well	6 (3.4)
A habit of eating soil	
Yes	5 (2.9)
No	169 (97.1)
Uses human feces as fertilizer	
Yes	9 (5.2)
No	165 (94.8)

the mother and her unborn child. Some studies within the country have documented similar prevalence.^[20] The prevalence in this study is, however, slightly higher than the stipulated 20% prevalence threshold in the endemic area recommended by WHO for the routine use of antihelminthic in pregnancy.^[20,21]

However, this report is lower than the prevalence documented in studies in some other African countries; a hospital-based study conducted by Ozumba *et al.* among pregnant women in Enugu, Nigeria documented 30% and another hospital-based study among pregnant women by Egwuyenga *et al.* which reported 48.3%. Ndamukong in another study to determine the intestinal helminthic infections among pregnant Cameroonian women recorded a prevalence of 47.1%.^[14,15,19] Moreover, studies from other countries of the world have documented the various prevalence and mostly higher proportions; this further emphasizes the part of geographic variation in the distribution of helminths worldwide; research by Guerra *et al.* to determine the helminthic and protozoan intestinal infections in pregnant women in their

Table 5: Adjusted predictors of helminthic infection among the respondents

Variables	AOR	95% Confidence Interval
Age (years)		
≥30	0.530	0.234-1.202
< 30	1.000	
Level of Education		
Primary education	1.738	0.719-3.056
Secondary education and above	1.000	
Handwash before eating		
No	1.000	0.106-9.080
Yes	0.978	
The habit of eating soil		
No	0.392	0.089-1.733
Yes	1.000	
Use of human feces as fertilizer		
Yes	1.756	0.374-8.252
No	1.000	
Waste disposal		
Pit latrine, bush	2.307	0.857-6.213
Water closet	1.000	
Source of water supply		
Pipe borne water	0.962	0.413-2.242
Well, stream	1.000	
Trimester		
1 st	1.805	0.495-6.583
2 nd	2.201	0.923-5.252
3 rd	1.000	

first consultation at Health Centers of the State in Sao Paulo, revealed a prevalence of 45.1%. A similar study by Rodriguez-Garcia *et al.* on the prevalence and risk factors associated with intestinal parasitosis in pregnant women in Mexico reported a prevalence of 38.2%.^[22,23]

Ascaris lumbricoides was the most prevalent helminth among the study population. This is similar to the prevalence of 9.7% reported by Kinikanwo *et al.* among pregnant women in the Niger Delta region in Nigeria.^[20] Nevertheless, it is higher than the report by Wekesa *et al.* with a prevalence of 6.5% among pregnant women attending ANC in Kenya.^[24] It is, however, lower than the report by Egwunyenga *et al.* in a multicenter hospital-based study among pregnant women in Nigeria.^[15] *Ascaris lumbricoides* is a common infection due to its worldwide distribution, its ease of spreading through fecal pollution of soil, the ability of its egg to withstand drying, and a lengthy period of survival in the soil. Poor personal hygiene and consumption of poorly processed vegetables also contribute to its infection among people.

Hookworm infection was the second prevalent helminth in the study with a prevalence of 7.5%. This is similar to the report documented by Fuseini *et al.* in a study of plasmodium and intestinal helminth distribution among pregnant women in Ghana with a prevalence of 7.9%. Wekesa *et al.* in a study among ANC attendees in Kenya documented a lower prevalence of 3.9%.^[24,25]

However, Dimejesi *et al.* in a study among pregnant women attending tertiary facility in Southeast, Nigeria and Alli *et al.* in a study among ANC attendees in University College Hospital, Southwest, Nigeria reported a higher prevalence of 20.6% and 35.8%, respectively.^[26,27] These differences may be attributed to the varying cultural practices of the different populations of study e.g. agriculture and also a high level of unhygienic practices like indiscriminate sewage disposal and barefoot walking. Hookworm infection is also an important etiological cause of anemia among women of reproductive age.^[28]

The prevalence of *Trichuris trichuria* in this study was 3.4%. Wekesa *et al.* in a study among pregnant women attending ANC in Kenya documented a lower prevalence of 1.3% and Kinikanwo *et al.* in a study among pregnant women in the Niger Delta region of Nigeria reported a prevalence of 2.2%.^[20,24] The lower prevalence of *T. trichiura* is in agreement with so many other studies which further reinforce the belief that it is less common in the humid tropic region. Its transmission is mostly through the ingestion of infective ova from contaminated food, drinks, or contact with contaminated hands.

The predictors of helminthic infection among the study population were younger pregnant women, pregnant women who had low educational status and who did not practice handwash before eating. This is also similar to findings from a study by Woodburn *et al.* among pregnant women in Entebbe, Uganda.^[29] This possibly emphasizes the positive influence of education in providing basic knowledge or information on personal and environmental hygiene and proper food preparation.

The limitations of the study are; firstly, it's a cross sectional study which does not establish a temporal sequence and thus limit the causal conclusion. Secondly, it is a hospital-based study, hence it may underestimate true prevalence and also mask the magnitude of helminth infection among pregnant women in the community.

Conclusion

The prevalence of intestinal helminthic among the study population was high and *Ascaris lumbricoides* were the most prevalent helminthes. Illiteracy, poor personal, and environmental hygiene such as lack of handwash practice and poor waste disposal method significantly increase the risk of pregnant women to intestinal helminths.

Intervention such as encouraging female education, improve hygiene practices and incorporation of routine screening for helminth and deworming of pregnant women during ANC in

the endemic regions would go a long way in reducing the burden of worm infection.

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Conflicts of interest

There are no conflicts of interest.

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