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■ Original Research Article

The Prevalence of Soil Transmitted Helminthic Infections in pregnancy at Abubakar Tafawa Balewa University Teaching Hospital, Bauchi

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ABSTRACT:

Background: Soil transmitted helminths (STH) are a group of multicellular parasites of man belonging to phyla Platyhelminthes and nemathelminthes. They are of public health significance as they cause infections in billions of the world population. When there is heavy burden of infection in pregnant women, they are associated with grave morbidity and mortality in the mothers and their foetus(es). **Aims:** To determine the prevalence of soil transmitted helminth infections and their association with anaemia among pregnant women attending antenatal care at ATBUTH, Bauchi **Settings and Design:** A hospital based cross-sectional study involving pregnant women attending antenatal care at ATBUTH, Bauchi. **Methods and Material:** The respondents were asked to bring freshly passed stool samples in a universal bottle and venous blood samples were collected from all of them at booking after consents were obtained and the specimens were analysed. **Statistical analysis used:** Simple descriptive statistics was used to analyze background characteristics. Chi square and student t-test were used to test for association between Haemoglobin levels and soil transmitted helminth (STH) infections. **Results:** Of the 354 pregnant women that participated in this study, only 15 of them had STH infections putting the overall prevalence to be 4.2%. Four different helminths were identified, and Hookworm was the most prevalent constituting 60%. The prevalence of anaemia was 125 (35.3%) and there was statistically significant association between STH infection and anaemia in pregnancy (OR= 2.884, χ^2= 4.180, *P*-value= 0.041). **Conclusions:** The prevalence of STH infection is relatively low and only four different organisms were identified. There was statistically significant association between STH infections and anaemia among pregnant women attending antenatal care at ATBUTH, Bauchi.

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INTRODUCTION

Helminths are a group of parasitic worms which are multicellular organisms and live as parasites in both humans and other animals.[1] Soil transmitted helminths (STH) are recognized among the neglected tropical diseases (NTD) which are a heterogenous group of communicable diseases predominantly found in the tropical regions of the world affecting more than a billion people.[2] STH are different species of nematode and trematode worms and the common ones in Nigeria include Ascaris lumbricoides, hookworms, Trichuris trichiura, Enterobius vermicularis, Strongyloides stercoralis and Toxocara species.[3,4] They are worldwide in distribution but commonly occur in warm and humid regions of the world, where adequate sanitation and good hygiene are still elusive. [5] Other risk factors for their transmission include drinking of contaminated water, ingestion of infested fruits and vegetables, geophagia, use of human faeces on farms, barefoot wandering on farmlands, uncontrolled defaecation and altered immune state as in pregnancy. [5,6] Anaemia in pregnancy is still a major cause of both maternal and perinatal morbidity and mortality in Northern Nigeria.[7] Soil transmitted helminths contribute majorly to the maternal morbidity and mortality associated with severe anaemia in pregnant women through chronic loss of blood from the mucosal and submucosal membranes, micronutrient deficiencies as a result of poor food intake and reduced absorption due to high burden of worms in the intestines.[8] The role of hookworm infestation in the aetiology of anaemia in both pregnant and non-pregnant women has been recognized and documented in the literatures and the degree of reduction in haemoglobin concentration is related directly to the burden of worm infestation.[9] This study assessed the prevalence, the types and intensity of STH and their association with haemoglobin concentration among pregnant women at Abubakar Tafawa Balewa University Teaching Hospital, Bauchi.

Study Area
This study was conducted at the antenatal care clinic of Abubakar Tafawa Balewa University Teaching Hospital, Bauchi, Bauchi State, Nigeria.

Study Design
This was a hospital based cross-sectional study.

Study Population
The study population involved pregnant women booking for antenatal care at Abubakar Tafawa Balewa University Teaching Hospital, Bauchi between August 2017 and February 2018.

Ethical Guideline
Ethical clearance was obtained from the Research ethics committee of ATBUTH, Bauchi. The nature, objectives, and the procedure of the study were duly explained to each pregnant woman by the trained nurses and the author, following which a written consent was obtained before recruitment into the study. The women were offered the options to opt out of the study at any time, with serious assurance that such action will not affect their quality of care in the hospital.

Inclusion Criteria
This included women with confirmed singleton pregnancies aged 15-45 years old who booked antenatal care at ATBUTH, Bauchi, at the given period that gave consent for recruitment in the study. The respondents cut across the three trimesters of pregnancy.

Exclusion Criteria
The under listed women were excluded from the study following history taking, examination and counseling; pregnant women who declined consent following adequate counseling, pregnant women with twin gestations, haemoglobinopathies, antepartum haemorrhages, medical conditions of hypertensive disorders in pregnancy, malaria and urinary tract infections in pregnancy, and women who received antihelminthic drugs within the last six months.

Stool Sample Collection
The recruited patients were given a pair of waterproof gloves each, sterile universal bottle and an applicator for the stool sample collection. They were educated on how to handle the specimens to avoid contamination of the stool specimen while also observing good hygiene. The subjects were told to collect freshly passed faeces, about one-

tenth filled in the sterile universal bottle, in the morning of their presentation to the hospital.

Microscopic Examination of Formed Faeces
This was performed by placing a drop of fresh physiological saline on one end of a clean glass slide and an iodine drop at the other end.[10,11] About two milligram of the stool specimen was added at each end containing saline and iodine solution, and they were mixed with the aid of an applicator stick.[11] These formed smooth thin emulsions in saline and iodine at both ends of the glass slide which were then covered with transparent cover glasses.[11] With the aid of the microscope, the slides were examined for the detection of eggs, cysts, or larvae using 10x and 40x objective magnification with the condenser iris closed adequately to give good contrast.[10,11]

Faecal Concentration Technique
The faecal concentration technique was carried out using formol ether concentration technique.[10] It involved the use of an applicator stick to emulsify about one gram of faecal matter in about eight milliliters of 10% formol water contained in a tube.[10,11] The emulsified faecal matter was filtered, leaving the suspension in a beaker which was put in a hard glass in addition to 4 milliliters of diethyl ether.[10,11] This was mixed for 60 seconds and subsequently centrifuged at 3,000 revolutions per minute for 60 seconds with the glass tube closed.[11] Measures were taken to ensure all the faecal matter settled in the tube by using a stick to loosen the layer of faecal debris from the side of the tube.[11] Afterwards, the supernatant was thrown out. The remaining residue was re-suspended by hitting gently the base of the tube and this was transferred to a slide, with the aid of a Pasteur pipette and covered with a cover slip.[10,11] The slide was examined under the microscope with the 10x and 40 x objective magnifications, with the iris condenser closed properly to give a good contrast.[10,12]

Blood Sample Collection
Two millilitres of their venous blood samples were collected from the antecubital fossa veins of the subjects under strict aseptic conditions, on the day of presenting the stool samples. The blood samples were put in a labelled ethylene diamine tetraacetic acid (EDTA) bottle and taken to the laboratory, where their haemoglobin concentrations were measured using a standardized portable HemoCue photometer.

Data Analysis
All statistical analysis were performed using Microsoft excel spreadsheet and SPSS statistical package (version 21). Simple descriptive statistics was used to analyze background characteristics. Frequencies and percentages were summarized using charts and tables.
Chi square was used to test for association between Haemoglobin levels and soil transmitted helminth (STH) infections. Haemoglobin levels of women with and without soil transmitted helminth infections were compared using independent student t-test. Data on haemoglobin levels were categorized and further compared among women with and without soil transmitted helminth infections using chi-square.

RESULTS

Table I: Background characteristics of study participants

Characteristics	Frequency N=354	Percentage (%)
Age (years)		
<20	17	4.8
20-29	203	57.2
30-39	124	35.0
≥40	10	2.8
Education		
No formal	23	6.5
Primary	30	8.5
Secondary	134	37.8
Tertiary	167	47.2
Religion		
Christianity	81	22.9
Islam	273	77.1
Ethnicity		
Hausa/fulani	222	62.7
Igbo	23	6.5
Jarawa	20	5.6
Yoruba	11	3.2
Others*	78	22.0
Occupation		
Housewife	213	60.2
Civil servant	78	22.0
Trading	34	9.6
Students	27	7.6
Others*	2	0.6
Residence		
Urban	328	92.7
Rural	24	6.8
Missing	2	0.6
Parity		
Primigravidae	84	23.7
1-4	203	57.3
≥5	67	18.9
Gestational age		
First trimester	24	6.8
Second trimester	172	48.7
Third trimester	158	44.5

Soil transmitted helminths	Frequency	Percentage
Present	15	4.2
Absent	339	95.8
Total	354	100.0
STH types	Frequency	Percentage
Hookworm	9	60.0
Enterobius vermicularis	3	20.0
Schistosoma mansoni	2	13.3
Diphyllobothrium latum	1	6.7
Total	15	100.0

*Include Gerawa, Sayawa, Ebira, Ngas, Idoma, Tiv, Kanuri, Gelebi etc

*Include seamstress, hairdresser

Of the 354 pregnant women recruited in this study, only 15 of them had soil transmitted helminths, putting the overall prevalence of STH infections in ATBUTH, Bauchi, to be 4.2%.

Table 2: Prevalence and types of STH

Table 3: Prevalence of anaemia among the study population

Anaemia	**Frequency**	**Percentage**
Yes (<11g/dl)	125	35.3
No (≥11g/dl)	229	64.7
Total	**354**	**100**
Anaemia	**Frequency**	**Percentage**
Mild (10-10.9g/dl)	98	78.4
Moderate (7-9.9g/dl)	25	20.0
Severe (< 7g/dl)	2	1.6
Total	**125**	**100**

Table 4: Association between STH infections and low haemoglobin levels

Anaemia	STH		X^2	*P*-value	Odds ration	(95%CI)
	Yes	No				
Yes	9(60.0)	116(34.2)				
No	6(40.0)	223(65.8)				
Total	15(4.2)	339(95.8)	4.180	0.041	2.884	(1.002-8.299)

The commonest helminth ova seen in the study was hookworm ova 9 (60%). The densities of the ova seen in all positive samples were 1-2 per low power field. Mean haemoglobin concentration for pregnant women with STH infection was 10.33 ± 1.92g/dl while the mean haemoglobin concentration for those without STH infection was 11.29 ± 1.08g/dl (student t-test = 3.223, *P*-value=0.001).

DISCUSSION

The overall prevalence of STH infections from the study was 4.2%. This study prevalence was higher than the prevalence of 0.7% reported by Mordi et al in Edo State, Nigeria and 0.6% reported by Mahande et al in northern Tanzania.[13,14] The study prevalence was comparable to prevalence of 6.9% reported by Arinola et al in Ibadan, Nigeria and a prevalence of 5.8% reported by Kuete et al in Doula, Cameroun.[15,16] However, this prevalence is lower than 23.6% reported by Ozumba et al in

Enugu and 43.4% by Alli et al at the University College Hospital, Ibadan.[10,17] The prevalence of only 4.2% in this study was relatively low but could be explained by the comparatively high literate level of the respondents and the fact that this study was an epidemiological type and the participants were asymptomatic and any ova or larvae of the helminths seen may be low in intensity and likely undetectable.[18] More so, there could be seasonal variation as this study was done during the dry season. The variation in the prevalence rates noted above could be likely due to differences in sample sizes applied and difference in geographical habitats of the studies. [10,19]

There were four identified soil transmitted helminths in this study, and they include hookworm, Enterobius vermicularis, Schistosoma mansoni, and Diphyllobothrium latum which were like the helminths reported in other studies in Nigeria. [8,13,14,20] Hookworm was the most common of the four helminths, followed by Enterobius vermicularis, Schistosoma mansoni, and Diphyllobothrium latum. Hookworm infection which was the most prevalent in this study could be transmitted by both skin penetrations and through oral routes. [21,22] The statistically significant association between barefoot walking and STH infections in this study could partly explain the high prevalence of hookworm infection, which is transmitted through penetrations of the skin.[23]

The high prevalence of hookworm in this study is similar to the findings by Green et al in Port Harcourt, Nigeria, Getachew et al in southern Ethiopia, Baidoo et al in Kumasi, Ghana and Kunwar et al in Nepal.[5,24,25,26] All the pregnant women found with soil transmitted helminths in this study had single type of helminthic infection and this was consistent with the findings by Shrinivas et al in which there were no mixed infections observed.[8] However, in some studies, mixed infections were noted.[24,26,27] There were low density infections in all the 15 pregnant women found with STH infections in this study (1-999 eggs per gram). This was comparable to the study reported by van Eijk et al, where the helminths seen were of low density.[18]

Using the WHO definition of anaemia in pregnancy as haemoglobin concentration less than 11.0g/dl, the prevalence of anaemia among the pregnant women in the study was 35.3%. Majority of the anaemic pregnant women had mild degree of anaemia. [7,28] While moderate anaemia was in the middle, severe anaemia was the least among them. The prevalence of anaemia among pregnant women in this study was similar to 39.7% reported by Muhangi et al in Uganda, and 44.1% by Green et al in Port Harcourt.[5,29] It was lower than 71.3% reported by Dattijo et al at Azare, 60% by Shrinivas et al, and 55.6% by Baidoo et al in Ghana.[7,8,25] Comparatively, Getachew et al showed in their study that mild anaemia was more common with a prevalence of 55%, followed by moderate anaemia of 42.1% and severe anaemia of 2.9%.[30]

This study showed that there was a significant association between STH infections among the participants and anaemia in pregnancy. With the odd ratio of 2.884, it showed that pregnant women with STH infections are 3 times more likely to be anaemic than those without STH infections. The student t test also confirmed the strength of the association of STH infections with low haemoglobin concentration.

The findings on the association of STH infections with maternal anaemia is similar to the findings of Getachew et al, which showed that there was a significant association between anaemia and STH infections with a *P*-value of 0.041.[30] Also, Arinola et al reported a statistically significant difference in serum iron of pregnant women with STH infection (116.8 ± 11.4µg/dl) when compared to those without STH infection (125.6 ± 8.4µg/dl) with a *P*-value of 0.02.[15] However, Dimejesi et al reported that there was no statistically significant difference between mean packed cell volume in STH infected and non-infected women *(P*= 0.18) and also the study by Muhangi et al showed no significant association between helminthic infection and anaemia.[21,29]

There was no statistically significant association between the perceived risk factors and STH infections in this study. There was significant association between walking barefooted around the house and STH infection in this study, which might explain the high prevalence of hookworm infection which is transmitted through skin penetration of the host by the parasite. [22,23]

In this study, soil eating habit had no statistically significant association with STH infection. However, this was contrary to reports by Green et al (*P*= 0.001) and Getachew et al (*P*= 0.008), where there were significant association between geophagia and STH infections. [5,24]

The toilet types used by participants were not significantly associated with STH infection and this is similar to reports by Obiakor-Okeke et al (P= 0.327).[31] But studies by Mahande et al (P< 0.001) and Green et al (P= 0.001) showed statistically significant association between STH infection and open field toilet system.[5,14] In addition, the association between washing of vegetables and patronizing food vendors and STH infections was not statistically significant. Only 23.7% of the study participants were aware that intestinal worms could affect pregnant women and 11.9% said it could cause shortage of blood in pregnant women while 4.8% each responded it could cause malnutrition, miscarriage, and abdominal pain. Majority of those who said intestinal helminths could affect pregnancy 51.2% have no idea of what effect helminths could have in pregnancy. Many of the respondents agreed that transmission of intestinal worms could be prevented. Majority of them acknowledged that good personal hygiene could prevent STH infections while 40.1% each believed avoidance of drinking contaminated water and washing vegetables before eating them could prevent STH infection. Only13.2% said avoidance of barefoot walking at home and in farms, which are implicated in hookworm infestation, can prevent STH infection.

CONCLUSION:

The overall prevalence of STH infections among pregnant women in Bauchi was 4.2% which was relatively low when compared to other reports from within Nigeria and other tropical countries. Four different species of helminths were identified which included hookworms, Enterobius vermicularis, Schistosoma mansoni, and Diphyllobothrium latum. Also the intensity of the STH infection found was low.

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