

Schistosoma mansoni and Soil Transmitted Helminth (STH) Infections among Pregnant Women Attending Primary Health Care Facilities in Lagos Mainland, Nigeria

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Abstract

In a cross-sectional survey among consented pregnant women, rapid diagnostic test (RDT) for malaria was carried out and stool examination was done to detect the presence of *Schistosoma mansoni* and soil transmitted helminthes using Kato-Katz technique. Intensity of infection was expressed as the number of eggs per gram (epg) of faeces. Prevalence of soil transmitted helminthes was 8.3% and 0.83% for *Schistosoma mansoni* while none was positive for malaria infection. Lack of co-infection with malaria could be connected with the intermittent preventive treatment with sulphadoxine pyrimethamine (IPTp-SP). Public health impact of soil transmitted helminthes and schistosomiasis infections in pregnancy may necessitate initiation of preventive treatment of helminth infections during pregnancy.

Keywords

Pregnancy, *Schistosoma mansoni*, Soil Transmitted Helminthes, Malaria

1. Introduction

Approximately 85% of the Neglected Tropical Diseases (NTD) disease burden results from helminth infections. Targeted control on school children is often advocated and is usually the main operation in sub-saharan Africa due to limited resources. However, exclusion of other groups, oftentimes comprising the adult population, makes re-infection almost inevitable in low resource rural endemic regions of the developing countries. These neglected groups (pregnant women

are inclusive) which are believed not to be sufficiently exposed to infection and often left untreated could serve as reservoirs of infection, bringing the distribution of the disease to pre-control level over time [1]. Hookworm infection occurs in almost half of Sub-saharan Africa's poorest people, including 40 - 50 million school-aged children and 7 million pregnant women in whom it is a leading cause of anaemia. Schistosomiasis is the second most prevalent NTD after hookworm [2]. An estimated 40 million women of child bearing age suffer from schistosomiasis [3] while recent estimates suggest that 819 million people worldwide are infected with *A. lumbricoides*, 465 million with *T. trichiura*, and 439 million with hookworm [4]. The risk of the individuals suffering from Soil Transmitted Helminth (STH) infection related morbidity appears to be a joint function of the number of species harboured and/or the infection intensity of any species [5]. Therefore the significance of co-infection of *Schistosoma mansoni* and soil transmitted helminthes in developing countries cannot but be emphasized taking into cognizance the significant morbidities attributed to these infections which include malnutrition, growth retardation, anaemia, vitamin A deficiency, and impaired intellectual performance [6]. This is even more among the vulnerable population such as pregnant women with suppressed immunity due to their pregnancy status. A number of studies have highlighted the significance of co-infection among different strata of the population but there are limited available epidemiological data on pregnant women. This study assessed the prevalence of these infections among pregnant women in Lagos.

2. Materials and Methods

A cross-sectional survey was carried from June to October 2016 at two Primary Health Care facilities located in Lagos Mainland Local Government Area, Lagos, Nigeria. Consented pregnant women were recruited and semi-structured questionnaires were administered to the pregnant women to obtain demographic and risk factors information. Rapid diagnostic test (RDT) for malaria (SD BIOLINE Malaria Ag P.f/Pan) was carried out for each pregnant woman. Thick and thin blood smear were done on same slide for those that were positive by RDT. Blood was also collected into heparinized capillary tubes for the estimation of packed cell volume (PCV). Stool examination for the presence or absence of *Schistosoma mansoni* and soil transmitted helminthes was carried out using Kato-Katz technique. The intensity of infection of the species of worms was expressed as the number of eggs per gram (epg) of faeces. The required sample size for this study was calculated based on 95% confidence level and 5% marginal error. Sample size (n) was determined using the formular as described by Araoye [7],

$$n = \frac{Z^2 P(1-P)}{D^2}.$$

The questionnaire which was developed and pilot tested had 31 questions in 4 sections which were the socio-demographic section, knowledge of soil transmitted helminthes infection, risk factors of soil transmitted helminthes, and knowledge of malaria infection. Knowledge of risk factors include the following

among others: questions on hand washing, type of toilet, questions on footwear usage and use of footwear when going to the toilet.

Statistical analysis was done using SPSS version 22 for windows. Descriptive statistics was employed for the analysis of demographic data. Estimation of prevalence and intensity of STH was calculated based on the stool. Chi-square was carried out to investigate the relationship between anemia and occurrence of parasitic infection in the study.

3. Ethics Statement

The study protocol was reviewed and approved by the Institutional Review Board of Nigerian Institute of Medical Research. The study was conducted in accordance with the tenets of Helsinki Declaration of 1964 as amended in 2013 and guidelines of Good Clinical Practice.

4. Results

The prevalence of soil transmitted helminthes among the 120 pregnant women examined was 8.3% (10) for soil transmitted helminthes (*A. lumbricoides*—7.5% (9); Hookworm—(1) 0.83%) and 0.83% (1) for *Schistosoma mansoni* while none was positive for malaria infection. There was no statistically significant difference ($P = 0.67$) in the infection rate of the various age groups examined, though age group 37 - 42 had no infection. The infection rate was not related to the education of participants ($P = 0.168$) (**Table 1**). Only 40% of the pregnant women had knowledge of soil transmitted helminthes out of which 8.3% were positive for infection. There was no significant association between knowledge of soil transmitted helminthes and infection among pregnant women. Of those walking bare footed and using shared toilet facilities, 60% and 12.8% were infected respectively (**Table 2**). Despite the fact that all the infected pregnant women with STH had light infection, 50% of them were anaemic which occurred in all age groups except 37 - 42 years age group while the only *S. mansoni* infected pregnant woman had moderate infection and was also anaemic. Anaemia was significantly associated with infection in pregnant women ($P < 0.05$) (**Table 3**).

5. Discussion

Ascaris lumbricoides was the most common soil transmitted helminth infection recorded in this study. This might be attributed to the ability of a single worm to release up to 200,000 eggs per day coupled with the resistant nature of the eggs which have protective proteinous coats to extreme environmental conditions. The high proportion of infected women who engaged in the risk factor of walking barefooted to the toilets could be related to the low knowledge of the women concerning soil transmitted helminthes infection. The lack of co-infection of malaria and STH among pregnant women could be related to the intermittent preventive treatment with sulphadoxine pyrimethamine (**IPTp-SP**) which is a policy in all government health facilities as recommended by WHO in areas of

moderate to high malaria transmission in Africa [8] [9]. Though, *A. lumbricoides* infections are commonly asymptomatic, clinical complications of extra-intestinal or high numbers of ascarids have been well described [10]. The presence of hookworm and *Ascaris lumbricoides* infections could be responsible for blood loss as observed by van Ejik *et al.* [11] in Kenya and therefore soil transmitted helminthes could be regarded as a major cause of anaemia in these pregnant women having ruled out malaria infection using RDT. Also the anaemia observed in the only pregnant woman with moderate *Schistosoma mansoni* infection according to WHO [12] could be buttressed by other studies that evaluated the association of *S. mansoni* with pregnancy outcomes which have demonstrated an increased risk for anaemia, preterm deliveries, and low birth weight infants [3]. The significant statistical relationship between light *A. lumbricoides* infection and mild anaemia was consistent with the findings of Larocque *et al.*, [13] in Peru.

Table 1. Association of STH infection with socio-demographic characteristics among Pregnant Women Attending Primary Health Care Facilities in Lagos Mainland.

Characteristics	Number (n)	STH infection n (%)	X ²	P-value
Age groups				
18 - 24	31	5 (16.1%)	6.69	0.678
25 - 30	56	4 (16.0%)		
31 - 36	23	1 (4.2%)		
37 - 42	10	0 (0.0%)		
Education				
No education	2	0 (0.0%)	13.59	0.168
Primary school	16	4 (26.7%)		
Secondary school	79	5 (6.3%)		
Tertiary institution	23	1 (4.2%)		
Marital status				
Never married	6	1 (16.7%)	0.852	0.837
Married	114	9 (7.9%)		
Ethnicity				
Yoruba	97	9 (9.3%)	30.15	0.000**
Hausa	5	0 (0.0%)		
Igbo	14	1 (7.1%)		
Others	4	0 (0.0%)		
Religion				
Islam	66	4 (6.0%)	4.07	0.272
Christian	54	6 (11.3%)		
Occupation				
Unemployed	24	0 (0.0%)	20.43	0.156
Trader	48	2 (4.2%)		
Artisan	19	4 (21.0%)		
Civil servant	5	1 (20.0%)		
Private employment	22	2 (9.1%)		
Others	2	1 (50.0%)		

**Highly significant (P < 0.001).

Table 2. Association of STH infection with risk factors among pregnant women.

Characteristics	Number (n)	STH infection n (%)	X ²	P-value
Have you heard about STH				
Yes	48	4 (8.3%)	2.26	0.521
No	72	6 (8.3%)		
Place of defecation				
Own Pit latrines	3	0 (0.0%)	4.19	0.997
Own Flush toilet	70	5 (7.1%)		
Shared flush toilet	39	5 (12.8%)		
Bush/Field	1	0 (0.0%)		
Shared pit latrine	3	0 (0.0%)		
Elsewhere	4	0 (0.0%)		
Footwear in the toilet				
Yes	109	7 (6.4%)	17.31	0.001**
No	11	3 (27.3%)		
Water source				
Well	4	0 (0.0%)	1.62	0.951
Tap water	111	9 (8.1%)		
Water from vendors	5	1 (20.0%)		
Water treatment				
Yes	20	0 (0.0%)	2.42	0.490
No	100	10 (10.0%)		
Handwashing				
Yes	110	10 (9.1%)	1.10	0.777
No	10	0 (0.0%)		
Habit of walking barefoot				
Yes	5	3 (60.0%)	56.23	0.000**
No	115	7 (6.9%)		
Floor material				
Earth	2	0 (0.0%)	1.77	0.939
Cement	28	1 (3.6%)		
Tiles	90	9 (10.0%)		

**Highly significant ($P \leq 0.001$).

Table 3. Association of anaemia with soil transmitted helminths infection.

Variable	n	Anaemic	X ²	P-value
STH Infection:				
<i>A. lumbricoides</i>	9	4	61.23	0.000**
Hookworm	1	1		

**Highly significant ($P < 0.001$).

6. Conclusion

This finding confirms the public health impact of soil transmitted helminthes and schistosomiasis infections in pregnancy. This may necessitate initiation of preventive treatment of helminth infections during pregnancy.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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