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Environmental factors and the risk of urinary schistosomiasis in Ile Oluji/Oke Igbo local government area of Ondo State

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ABSTRACT

Geographic information systems are being increasingly used to show the distributions of disease where data for specific environmental risk factors are available. For successful transmission of schistosomiasis, suitable climatic conditions and biological events must coincide; hence its distribution and prevalence are greatly influenced by environmental factors affecting the population of snail intermediate hosts and human hosts. Prevalence and demographic data was obtained by parasitological examination of urine samples and questionnaire administration. The mean values of environmental factors corresponding to the local government area were obtained from remotely sensed images and data from climate research unit. The effects of the environmental factors were determined by using regression analysis to analyse the correlation of environmental factors to prevalence of schistosomiasis. There was a negative correlation between infection and elevation. There was a positive correlation between vegetation, rainfall, slope, temperature and prevalence of infection. There was also a weak negative correlation between proximity to water body and prevalence. The result shows the study area to be at low to high risk of infection.

1. Introduction

Schistosomiasis is a major health problem in Africa. Urinary schistosomiasis is endemic in 44 African countries including Nigeria with an estimated population of 101.28 million people who are at risk with 25.83 million persons infected (Vinod, 2008).

Despite the mass chemotherapy aimed at reducing morbidity, the prevalence of the disease in Nigeria may be increasing due to poverty, inadequate or total lack of public health facility, low illiteracy level and inadequate infrastructure. The lack of scientific information on the disease in many rural communities among the high risk groups particularly school age children is another important factor that has adversely affected control efforts.

The distribution patterns of parasitic diseases are greatly influenced by environmental factors. Geographic information systems and remote sensing have become important tools in predicting infection risk and identifying environment factors at local and broad scale related to risk and therefore allows decision makers to allocate limited resources meant for control interventions in a cost effective manner (Brooker et al., 2002a; Yang et al., 2005). Several studies have developed Africa wide risk maps for the transmission of malaria using climatic determinants of parasites transmission (Simoonga et al., 2009). To date, for schistosomiasis

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Table 1
Prevalence of *S. haematobium* infection in relation to gender (P < 0.05).

Sex	No examined	No (%) positive	No (%) negative
M	356	76(21.3)[a]	280(78.7)
F	404	50(12.4)[b]	354(87.6)
Total	760	126(16.6)	634(83.4)

no such maps except for several ongoing projects aimed at achieving this. One of the challenges in developing a continent-wide environmental based schistosomiasis risk map is the variation in biotic requirement of different snail host species that can be found all over Africa. It has been found that climatic suitability risk maps are peculiar for a particular location and cannot be used to predict risk in other places. However, each model could be extrapolated within the same ecological zone presumed to reflect the distribution of the different host snail species. (Brooker et al., 2002b). There is a need to develop an integrated risk map for schistosomiasis that takes into account variations in different climatic zones in order to develop an Africa wide risk map for schistosomiasis. Thus far, in Nigeria, a model of schistosomiasis has been developed at the national scale by Ekpo et al. (2013) and few other models at local scales (Ekpo et al., 2008; Adie et al., 2014). The present report appears to be the first attempt at developing a schistosomiasis risk map for Ondo State albeit at a local scale.

2. Methodology

2.1. Study area

Ondo State is situated in the heartland of the tropical rainforest belt of Western Nigeria. The climate is humid with small seasonal and daily variations. It lies between latitude 5°6N and 8°2N and longitude 4°17N and 6°17N. The average rainfall is concentrated during the months of May to October with a short break in August and considerable variations from year to year. Ile Oluji/Oke Igbo is one of the local government areas in Ondo state.

2.2. Field survey

The current prevalence of disease was determined by parasitological analysis of urine samples collected from inhabitants of geocoded buildings. Infections were detected by demonstration of eggs in urine. Questionnaires were also administered to obtain demographic and socio economic characteristics of the study population.

2.3. Remote sensed image and environmental data

Land surface temperature (LST) and the normalized difference vegetation index (NDVI) and altitude information were derived from satellite images using standard procedures. Minimum, mean and maximum values of these data were extracted for each pixel that corresponds to the location of the study area. Rainfall data was obtained from climate research units.

2.4. Data analysis

Analysis of relationships between household infection prevalence, environmental data and location of water bodies was studied using appropriate software (ESRI ARCGIS 10) Spatial Statistics and regression analyses were used to analyse the correlation of environmental factors to prevalence of schistosomiasis and develop a risk map in correlation to transmission risk.

Table 2
Prevalence of *S. haematobium* infection in relation to age (P < 0.05).

Age	No examined	No (%) positive	No (%) negative
<10	200	33(16.5)[a]	167(83.5)
10–19	251	59(23.5)[b]	192(76.5)
20–29	102	24(23.5)[c]	78(76.5)
30–39	76	6(7.9)[d]	70(92.1)
40–49	55	3(5.5)[e]	52(94.5)
50–59	33	1(3.0)[f]	32(97.0)
>59	43	0(0.0)[g]	43(100.0)
Total	760	126(16.6)	634(83.4)