Intestinal Parasitic Infection and Assessment of Risk Factors in North-Western, Nigeria: A Community Based Study

Kabiru Mohammed, Mohamed Rusli Abdullah, and Julia Omar
School of Medical Science/Department of Community Medicine/Universiti Sains Malaysia, 16150, Kubang Kerian Kelantan, Malaysia
Email: kmohd1970@yahoo.co.uk, {mrusli, julia}@kb.usm.my

Ikeh Eugene. I
Department of Medical Microbiology/School of Medical Science University of Jos Nigeria
Email: eugikeh@yahoo.com

Aziah Ismail
Institute for Research in Molecular Medicine/Universiti Sains Malaysia, Health Campus, 16150 Kubang K. Kelantan
Email: aziahismail@gmail.com

***Abstract*—Aim: Study was aimed to determine the prevalence and assessment of risk factors associated with intensity of intestinal parasitic infections in Sokoto, Nigeria. Materials and Methods: Parasitological examination was carried out on stool samples from 500 participants using formol ether concentration methods whose age ranges between 5 to >30 years. Results: Finding shows that 271 [54.2%] were positive for intestinal parasitic infections. Males recorded higher prevalence than the females with 85.4%, and 14.6% respectively. Predominant intestinal parasites identified in this study are *Entamoeba coli*, *Hookworms*, *Entamoeba histolytica*, and *Ascaris lumbricoides* with 17.0%, 6.6%, 6.2% and 5.0% prevalence, respectively. Conclusion: Intestinal parasites continue to remain a serious public health problem in North-western Nigeria. Low level of education, occupational status seems to be among significant risk factors for these infections. Creating awareness, level of sanitation, water supply and deworming programme among school children will reduce prevalence and intensity of parasitic infections among the study community.**

***Index Terms*—intestinal parasites, risk factor, sokoto nigeria**

I. Introduction

Intestinal parasites and soil transmitted helminthesin the developing countries of the world are considered a serious public health problem. Several factors are said to play a key role in the transmission of infection which includes amongst other socio-demographic, economic, political and cultural factor [1].

Despite considerable effort to prevent and control intestinal parasitic infections but still remain endemic in many West African Countries and Nigeria inclusive. The disease has a lot of significance and public health consequences with school age children mostly affected.

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According to an estimate, million are ill while billions are already infected as a result of these neglected tropical diseases (NTDs) which mostly are school children in which the burden of morbidity and mortality are high in developing countries [2].

Intestinal parasites and soil transmitted helminthiasis are common and affects the vulnerable group in the community such as children and pregnant women and the diseases are mostly found among the rural areas of the developing countries of Africa, Asia and Central America which are often associated with lack of safe water supply and poor sanitation [3].

II. Material and Methods

A. Study Area and Population

A community based cross sectional study was carried out in Sokoto State, North- western Nigeria. (Latitude 12^{o}N and $13^{o}58$N and Longitudes $4^{o}8$E and $6^{o}54$E) and occupies an area of 25,973 square kilometers. The study area is characterized by the presence of numerous rivers, stream, and dams including Sokoto River and River Rima. The main occupation of the people in the area is mainly farming and fishing. In 2006, National population census [4], Sokoto was estimated to have a population of 3696, 99 persons and dominated by Hausa/Fulani people. The main annual rainfall in the area is about 500mm to 1,300 mm with the highest peak in August and the vegetation type is northern guinea savannah. Dry season sets in first with the harmattan from October to February. Temperature can reach up to 38 ^{o}C during the day and humidity less than 20% [5].

B. Study Design

The study design was cross sectional and the study populations involved 500 school children and adults between the aged of 5 to 30 years and above were examined. The objective and methods of the study were

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explained to the school teachers and parents or guardians after series of meeting and informed consent was obtained.

C. Data Collection

- *Stool sample collection and laboratory procedure*

A cross-sectional parasitological survey was carried out in all households and selected schools. Participants were given clean, leak proof plastic containers labelled with their names, identification number. A single stool samples of each household member as well those of school children were examined according to the parasitological technique using formol ether concentration method. The slides were prepared in a field laboratory by a well-trained Scientist. After that, two experienced laboratory scientist of the medical parasitology laboratory, Usmanu Danfodiyo University, Sokoto, performed the microscopic examination. The result of schistosoma mansoni and other intestinal parasites were expressed quantitatively using formol Ether concentration techniques to obtain the number of eggs per 50 mg of stool. For each individual, the arithmetic mean eggs per gram (epg) of faeces based on the samples was calculated.

D. Data Analysis

The Chi-square test was applied to compare proportions between groups. The odds ratio was used to determine the strength of association of results from stool examinations between groups of the population. The relationship between infection with *various intestinal parasites*, demographic, socio-economic and water contact variables were explored using univariate logistic regression. Considering all variables revealing a *p*-value < 0.20 and sequentially removing the variable with the highest *p*-value until all variables showed a *p*-value < 0.05 was the adapted procedure of the multivariate logistic regression to develop the final model. All tests were carried out with 95% level of confidence. The software package SPSS 20.0 version was used to carry out these calculations

E. Ethical Consideration

The research was approved by the Ethical Committee of the State Ministry of health, Sokoto [Reference no. SMH/962B/Vol.1]. Consent was obtained from children and adults selected for the study after explaining the purpose and procedures, possible risks and inconveniences of the study. The school children's participating in this research and the individual household were guided on how to fill up the consent forms. The study was carried out between November, 2011 and September, 2012.

TABLE I. PREVALENCE AND DISTRIBUTION OF INTESTINAL PARASITES IN SELECTED COMMUNITIES OF SOKOTO STATE BY AGED GROUP AND GENDER

Parasites	**Age group (yrs.)**						**Gender**		
	5-9	10-14	15-19	20-24	25-29	30+	Male	Female	Total
E. histolytica	4[12.9]	13[41.9]	8[25.8]	1[3.2]	0[0.0]	5[16.1]	27[87.1]	4[12.9]	31[6.2]
E. coli	13[15.3]	42[49.4]	18[21.2]	5[5.9]	0[0.0]	7[8.2]	71[83.5]	14[16.5]	85[17.0]
A.lumbricoides.	3[12.0]	10[40.0]	9[36.0]]	1[4.0]	0[0.0]	2[8.0]	18[72.0]	7[28.0]	25[5.0]
S. mansoni	5[25.0]	9[45.0]	1[5.0]	2[10.0]	2[10.0]	1[5.0]	18[90.0]	2[10.0]	20[4.0]
Hook worm	5[15.2]	13[39.4]	9[27.3]	2[6.1]	1[3.0]	3[9.1]	29[87.9]	4[12.1]	33[6.6]
E. vermicularis.	1[5.4]	12[60.0]	4[20.0]]	1[5.0]	0[0.0]	2[10.4]	17[85.0]	3[15.0]	20[4.0]
G. Lamblia.	1[4.8]	13[61.9]	4[19.0]	1[4.8]	0[0.0]	2[9.5]	20[95.2]	1[4.8]	21[4.2]
T. trichiura.	0[0.0]	9[56.2]	5[31.2]	1[6.2]	0[0.0]	1[6.2]	15[93.8]	1[6.2]	16[3.2]
H. nana	2[10.0]	11[55.0]	5[25.0]	1[5.0]	1[5.0]	0[0.0]	16[80.0]	4[20.0]	20[4.0]
Taenia sp	1[1.3]	1[1.3]	0[0.0]	0[0.0]	1[10.0]	0[0.0]	0[0.0]	0[0.0]	3[0.4]

E. histo.- Entamoeba hiatolytica, E. coli- Entamoeba coli, A. lumbr - Ascaris lumbricoides, S. mansoni- Schistosoma mansoni, H.worm- Hookworm specie, E. verm.- Enterobius vermicularis, G. lamblia. - Giardia lamblia, T. trich.- Trichiuris trichiura, H. nana - Hymenolopsis nana, Taenia- Taenia specie

III. RESULTS

The result of our findings revealed that from a total of 500 participant selected for this study, 271 [54.2%] were found to be positive for *intestinal parasitic* infections. Table I, showed the distribution of ten different intestinal parasites among age group and gender and there was a statiscally significant difference by aged group P<0.05 but none by gender. In this study, protozoans infection such as *Entamoeba histolytica Entamoeba coli*, and *Giardia lamblia* seems to be the commonest and prevalent parasites found with a prevalence of 31 [6.2%], 85 [17.0%] and 21 [4.2%] respectively. In contrast intestinal helminthes showed a lower prevalent rate as compared to intestinal protozoa with hook worm, *Ascaris lumbricoides*, and *Schistosoma mansoni* being predominant with prevalence of 33 [6.6%], 25 [5.0%] and 20 [4.0%].

TABLE II. RISK FACTORS ASSOCIATED WITH INTESTINAL PARASITES INFECTION IN SOKOTO STATE, BY LOCATION, GENDER, AGE GROUP, EDUCATION LEVEL, MARITAL STATUS AND OCCUPATION

Demographic Variable	Disease N(%)	No Disease N(%)	Total N(%)	Crude OR	*P*-value	Adjusted OR	*P*-value
Location							
Wurno	47[17.4]	53[23.1]	100[20,0]	1		1	
Wamakko	175[64.6]	125[54.6]	300[60.0]	1.21[0.76,1.92]	0.409	1.36[0.80,2.32]	0,250
Gwadabawa	49[18.0]	51[22.3]	100[20.0]	2.22[1.40,3.52]	0.001*	1.32[0.79,2.21]	0.281
Gender							
Female	40[14.7]	33[14.4]	73[14.6]	1		1	
Male	231[85.2]	196[85.6]	427[85.4]	3.61[1.93,6.73]	0.001*	2.66[1.39,5.11]	0.003*
Age group							
>30	23[8.5]	9[3.9]	32[6.4]	1		1	
5-9	34[12.5]	47[20.5]	81[16.2]	1.65[0.99,2.75]	0.052*	1.43[0.84,2.45]	0.182
10-14	132[48.7]	126[55.0]	258[51.6]	0.94[0.52,1.72]	0.861	0.87[0.45,1.70]	0.699
15-19	63[23.3]	39[17.0]	102[20.4]	0.34[0.10,1.09]	0.071	0.31[0.09,1.69]	0.177
20-24	15[5.5]	7[3.1]	22[4.4]	0.38[0.04,3.58]	0.400	0.18[0.01,2.70]	0.222
25-29	4[1.5]	1[0.4]	5[1.0]	0.35[0.13,0.95]	0.040*	0.30[0.06,1.46]	0.137
Education							
Tertiary	2[0.7]	1[0.5]	3[0.6]	1		1	
No formal edu	39[13.7]	7[3.2]	46[9.2]	4.84[2.11,11.06]	<0.001*	3.58[1.43,8.94]	0.006*
Primary	229[80.6]	199[92.1]	428[85.6]	3.58[1.12,11.43]	0.031*	4.63[1.23,17.35]	0.023*
Secondary	14[4.9]	9[4.2]	23[4.6]	2.78[0.22,35.03]	0.428	2.93[0.24,42.8]	0.431
Occupation							
Others	36[12.7]	5[2.3]	41[8.2]	1		1	
Farming	182[64.1]	154[71.3]	336[67.2]	1.99[1.20,3.31]	0.007*	2.11[1.24,3.58]	0.005*
Fishing	29[10.2]	49[22.7]	78[15.6]	0.14[0.04,0.47]	0.002*	0.28[0.08,1.03]	0.057*
Irrigation	25[8.8]	3[1.4]	28[5.6]	0.49[0.17,1.42]	0.192	0.49[0.14,1.71]	0.264
Laundry	12[4.2]	5[2.3]	17[3.4]	0.16[0.06,0.42]	<0.001*	0.24[0.08,0.65]	0.005*
Parasites							
Taenia spp	0[0.0]	0[0.0]		1		1	
E.histolytica	4[1.9]	27[9.5]	31[6.2]	0.10[0.03,0.31]	<0.001	0.07[0.02,0.26]	<0.001*
E .coli	38[17.6]	47[16.5]	85[17.0]	0.53[0.35,0.95]	0.030	0.57[0.33,1.01]	0.055*
A.lumbricoides	7[3.2]	18[6.3]	25[5.0]	0.27[0.11,0.69]	0.006	0.33[0.12,0.95]	0.030*
S. mansoni	2[0.9]	18[6.3]	20[4.0]	0.08[0.01,0.35]	0.001	0.07[0.002,0.32]	0.001*
Hookworm	5[2.3]	28[9.9]	33[6.6]	0.13[0.05,0.34]	<0.001	0.12[0.04,0.334]	0.024*
E.vermicularis	7[3.2]	13[4.6]	20[4.0]	0.04[015,0.99]	0.048	0.30[0.11,0.86]	0.040*
G. lamblia	8[3.7]	13[4.6]	21[4.2]	0.44[0.17,1.09]	0.077	0.36[0.13,0.96]	0.098
T. trichiura	6[2.8]	10[3.5]	16[3.2]	0.43[0.15,1.21]	0.109	0.39[0.13,1.18]	0.008*
H. nana	5[2.3]	15[5.3]	20[4.0]	0.24[0.08,0.67]	0.007	0.23[0.07,0.68]	0.005*

[a]Simple Logistic Regression; [b] Multiple Logistic Regression. The model reasonably fit well,assumptions are met. There are no interaction and multicolinearity problems, model assumptions are met. There are no interaction and multicolinearity problems*The difference was statistically significant (p<0.05) Confidence interval of mean difference at 95%.

Table II Showed the various risk factors associated with intestinal parasitic infection by location, gender, Aged group, educational level, occupation in univariate analysis. The result shows that Infection with intestinal parasites was found to be higher in rural communities of Wamakko 1.36 times [OR; 95% CI, 0.80, 2.32: *p*-value 0.250] higher compared to those in the urban areas 1.32 times [OR: 95% CI: 0.79, 2.21; *p*-value 0.281] Table II There was no statistically significant difference between the communities p>0.05. In multivariate analysis, this was done using binary logistic regression and enter by stepwise method with 95% CI factors that remained significantly associated with infection were male gender 2.66 [OR: 95% CI; 1.39,5.11; *p*-value 0.003*], Educational level; Primary school 4.63 [OR; 95% CI, 1.23, 17.35; *p*-value 0.023*], No formal education 3.58 [0R: 95% CI: 1.43, 8.94; *p*-value 0.006*] (Table II). There was statistical significant difference in the variables observed p<0.05.

IV. DISCUSSION

This community based cross sectional study was aimed at determining the prevalence of intestinal parasites and assessment of risk factors associated with intensity of infection among three communities in Sokoto state, Nigeria. The result of the present study revealed an overall prevalence of 271[54.2%]. The high prevalence of intestinal parasites recorded in our study is similar to that reported in western Tajikistan by [6], North-east Ethiopia by [7] and North central Nigeria by [8]. Higher prevalence was also reported by [9]. The higher prevalence might be attributed to the presence of resistant cyst found in the study area which can withstand adverse environmental conditions.

The present study revealed that males gender are more susceptible to infection 85.2%, 2.66 [OR: 95% CI; 1.39, 5.11 *p*-value 0.003*]; than the females 14.7% (Table II). This finding was found to be similar with that reported by

[8], and [10]. The higher prevalence in relation to gender are probably due to the fact that males are mostly engaged in animal husbandry and this might be the reason for the higher significant difference. In contrast [11] reported that female was found to have higher prevalence rate in his study carried out in North-western Ethiopia.

The most common intestinal parasitic infection identified in the three communities include amongst others *E. coli* 0.57 [OR; 95% CI: 0.33, 0.97; *p*-value <0.001] followed by *Hookworm specie* 0.12 [OR; 95% CI; 0.04, 0.30 *p*-value 0.001 and *Entamoeba histolytica* 0.07 [OR; 95% CI; 0.02, 0.26, *p*-value <0.001]. A statistical significant difference was observed in all the common intestinal parasites study $p<0.05$ (Table II). This finding was similar to those reported by [11] in Ethiopia. In contrast [12] in Nigeria found an opposite result from his study. Thus, 10-14 years aged group and 5-9 years had a prevalence of 51.6% [OR; 0.87, 95%CI; 0.45, 1.70 *p*-value 0.699] and 16.2% OR; 1.43 95% CI; 0.84, 2.45 *p*-value 0.182. This finding was consistent with reports by [12].

Results shows that there is a strong association between intestinal parasitic infections and education of the participants ($p<0.05$). Thus primary school children are at higher risk of infection 4.63 time [OR; 95% CI, 1.23, 17.35; *p*-value 0.023*] compared to those in the tertiary institution and a statistically significant difference was observed $p<0.05$ (Table II). This is in agreement with the result found in Benue, Nigeria by [13] Reason for this lies in the continual exposure of the school children to contaminated environment, being more active, and playful to contaminated soil thus more vulnerable to intestinal parasitic infections for both protozoan and helminths.

Study revealed that those whose parent occupation is farming were 2.11 times [OR: 85% CI; 1.24, 3.58; *p*-value 0.005*] likely to be at higher risk of intestinal parasitic infection when compared to others occupation. A statistical significance difference was observed $p<0.05$ (Table II). This is similar to the report in Perak Malaysia by [14]. Reason being that children accompany their parent to farms and as such they play with the contaminated soil and negligent of their environment thus became more vulnerable to the common intestinal parasitic infections. Thus poverty is often hidden which contributes significantly to the high prevalence due to poor living condition, lack of safe water, sanitation and education.

V. Conclusion

Based on our findings, intestinal parasitic protozoans and helminths was found to be among the highest neglected tropical disease affecting school children and adults in the communities studied and has therefore cause a serious public health problem. Children playing in an unhygienic environment and subsequently contaminating their hands are considering one of the factors associated with the infections. Deworming programme among school children, improvement of safe water supply, health facilities, as well as health education are needed so as to reduce the rate of intestinal parasitic infection.

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Kabiru Mohammed, a fourth-year PhD candidate at Department of Community Medicine, School of Medical Sciences (PPSP), Universiti Sains Malaysia (USM) Health Campus, Kelantan, 16150 Malaysia.

Ikeh E. Ifeanyi, PhD, a medical parasitologist at Department of Medical Micro-biology, Faculty of Medical Sciences, University of Jos, Nigeria.

Mohamed R. Abdullah, a PhD in tropical medicine, former head at Department of Community Medicine, School of Medical Sciences (PPSP), Universiti Sains Malaysia (USM) Health Campus, Kelantan, 16150.

Aziah Ismail, a PhD in molecular medicine at Institute for Research in Molecular Medicine, Universiti Sains Malaysia (USM) Health Campus, Kelantan, 16150.