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Human intestinal parasitism, potable water availability and methods of sewage disposal among nomadic Fulanis in Kuraje rural settlement of Zamfara state

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ABSTRACT

Objective: To ascertain the level of intestinal parasites vis-à-vis the quality of housing and water supply, and sanitary conditions among the people of Kuraje village in Zamfara state. **Methods:** The study was cross sectional in nature. Individual households were selected using systematic random sampling methods and pre-tested questionnaires were administered to all the members of each household. Stool samples were collected and processed using standard laboratory procedures. Housing conditions, sources of water and sanitary conditions of the households were also inspected. Results were analysed using Epi Info 2006 model. **Results:** The prevalence of intestinal parasites was 67.0% (347/519). 72.3% (251/347), 17.0% (59/347), and 10.7% (37/347) had one, two and three or more parasites, respectively. The associated factors with intestinal parasites were poor housing and sanitary conditions, lack of potable water and illiteracy. The commonest parasites encountered were hookworm (22.0%), *Ascaris lumbricoides* (18.5%), and *Strongyloides stercoralis* (15.6%) while the least common was *Enterobius vermicularis* (1.6%). Others were *Giardia lamblia* (5.7%), *Hymenolepsis nana* (5.0%), *Trichuris trichiura* (8.8%), *Entamoeba histolytica* (14.4%) and *Schistosoma mansoni* (8.4%). **Conclusions:** The infection rate of intestinal parasites in Kuraje village is high. More efforts should be intensified towards improvement in sanitary and housing standards, supply of potable water and institution of a more comprehensive literacy programme for the people of the community.

1. Introduction

Intestinal parasitic diseases remain a serious public health problem especially in many developing countries largely due to faecal contamination of water, food and drinks[1,2]. They are among the most common infections worldwide and it is estimated that some 3.5 billion people are affected, and that at least 450 million are ill presently as a result of parasitic infections, with the majority being children[3]. These infections constitute a serious health challenge as they cause iron deficiency anaemia, growth retardation in children and other physical and mental health problems[4,5]. The complexity of these parasitic intestinal morbidities has largely been compounded with the advent of the human immunodeficiency virus (HIV) infections[6].

Over the past decade the Federal Ministry of Health of Nigeria in collaboration with other agencies has embarked on worm eradication programmes through provision of potable water, health education and improvement in sanitary and housing conditions of both her urban and rural populace[7,8]. This is in a bid to achieving one of the cardinal components of the millennium development goals which is improvement in quality of healthcare of the people[9].

The provision of potable water and standard sanitary facilities in adequate proportion to the targeted and individual communities and overall impact on them appear to be the major challenge threatening a countrywide success of the sanitation programme[10,11]. This study was therefore undertaken to assess the availability of these facilities in relation with the rate of human intestinal parasitism among the nomadic Fulanis in Kuraje village of Zamfara state who represent a prototype rural community in over 70% of the geographic north western Nigeria.

2. Materials and methods

The study was carried out in Kuraje village, a settlement

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on the outskirts of Gusau, the capital city of Zamfara state north west Nigeria. It was performed between September and first half of December 2009. Prior to the commencement of the study an advocacy visit was paid to the ward head and his kin men in July, 2009. Households were selected using systematic random sampling methods. Among the 519 respondents in Kuraje community, 236 (45.5%) were males and 283 (54.5%) were females with age interval of 6 to 81 years, and the mean age as (28±1) years. Sanitary conditions in each household were inspected along with sources of water and methods of housing. This inspection was extended to other households ruled out by sampling methods as well. A questionnaire was administered to each willing member of the household aged six years and above for convenience; information such as age, sex, educational level, sources of water and methods of sewage disposal were obtained. Individual oral consents were obtained from the respondents. Identification numbers and specimen containers were given and instruction on how to produce the specimen was adequately explained in simple language to the respondents. Faecal samples were collected and transported within an hour to the Parasitology Laboratory of Women and Children Hospital Gusua for analysis while treatment with appropriate antihelminths was given to those infested.

2.1. Microscopy

Each stool sample was examined macroscopically, using saline preparation with slightly ward (about 36 ℃) 0.9% sodium chloride, and concentrated using formal ether concentration method. Preparations were subsequently examined for eggs and larvae of intestinal parasites with Lugol's iodine using 5×, 10× and 40× microscope objectives[12].

2.2. Analysis of results

Data obtained was analysed by Epi Info 6 statistical software; Chi squared test was used to determine association, factors related to the infection of intestinal parasitism were determined through correlation analysis, and P-value of $\leqslant$ 0.05 was accepted as significant.

3. Results

The prevalence of intestinal parasites was found to be 66.9% (347/519). An analysis of the rate of intestinal parasites among the respondents in relation to gender showed that 83.1% (196/236) of males and 52.3% (148/283) of females were infected ($P<0.05$).

A review of the rate of intestinal parasites among the respondents in relation to age distribution pattern showed no significant association with age ($P>0.05$). Those aged 10 years and below [88.4% (38/43)] and those above 70 years [87.5% (14/16)] recorded the highest rate of infections, while those aged 61–70 years recorded the lowest rate of infection [37.9% (11/29)] (Table 1).

The risk factors associated with presence of intestinal parasites were use of huts, brick houses and cement houses (compared with cement house, $P<0.001$); open air defaecation, utilization of pit latrines and water closet (compared with water closet, $P<0.001$). Besides, there was strong correlation between reduction in rate of intestinal parasites and increase in educational levels (RR=1.4, 95% CI=1.3–2.2). There was no significant difference in rate of infection among those who obtained water from ponds, wells and rivers as compared to those who used tap water ($P>0.05$) (Table 2).

Overall parasites species were detected 487 times from the stool samples of the 347 respondents with intestinal parasites consisting of one parasite specie per stool sample, (72.3%, n=251), two parasite species per stool sample (17.0%, n=59) and three or more parasite species per stool sample (10.7%, n=37). The most frequent parasites encountered were hookworms (22.0%, n=107), *Ascaris lumbricoides* (18.5%, n=90), *Strongyloides stercoralis* (15.6%, n=76) and *Entamoeba histolytica* (14.4%, n=70) while the least common parasite was *Enterobius vermicularis* (1.6%, n=8). Other parasites encountered were *Giardia lamblia* (5.7%, n=28), *Hymenolepsis nana* (5.0%, n= 24), *Schistosoma mansoni* (8.4%, n=41) and *Trichuris trichiura* (8.8%, n= 43).

Table 1

Rate of Intestinal parasitism and age distribution pattern among residents (n=519) [n(%)].

Age Interval (Years)	Infected(%)	Uninfected(%)
0–10 (n=43)	38 (88.4)	5 (11.6)
11–20 (n=100)	66 (66.0)	34 (34.0)
21–30(n=122)	81 (66.4)	41 (33.6)
31–40 (n=110)	66 (60.0)	44 (40.0)
41–50 (n=57)	42 (73.4)	15 (26.6)
51–60 (n=42)	29 (69.0)	13 (31.0)
61–70 (n=29)	11 (37.9)	18 (62.1)
⩾71 (n=16)	14 (87.5)	2 (12.5)

X^2 (Mantel–Haenszel)= 0.00, OR= 1.01, RR= 1.01, $P>0.05$.

Table 2

Risk factors associated with presence of Intestinal parasites among residents.

Variables	Determiner	Total	No. infected	Percentage (%)
Sources of water	Ponds	119	72	60.5
	Tap water	33	18	54.5
	Wells	205	166	81.3
	Rivers	162	91	56.2
Type of housing	Hut	346	300	86.7
	Brick	157	46	29.3
	Cement△	16	1	6.3
Type of toilet facilities	Open air	447	340	76.1
	Pit latrine/Trenches	59	6	10.2
	Water system△	13	1	7.7
Educational levels (Adjusted to adult age only)*	Nil	318	302	95.0
	Primary	67	8	11.9
	Secondary	49	5	10.2
	Tertiary	10	2	2.0

NB: * = Only adults 18 years and above were subjected to analysis; △ $P<0.01$.

4. Discussion

The prevalence of intestinal parasites among the Fulanis in Kuraje village was 67.0%. 72.3%, 17.0% and 10.7% of those infected had one, two and three or more parasites, respectively. Even though there has been no similar documented study from the locality in the past, the 67.0% prevalence is quite high and the disease still is endemic in the locality. This finding compares well with that from two separate studies in Benue State where prevalence rates ranged from 40% to 71%[13,14], and in Ethiopia and South Africa where prevalence of 83.8% and 55.8% respectively were recorded[15,16]. This makes the disease still endemic in African.

The main contributory factors to the high prevalence of intestinal parasites in the present study were absence of standard sanitary facilities sunch as open air defaecation, use of trenches and pit latrines, poor housing conditions ($P<0.05$), and illiteracy ($P<0.05$). Policy formulators and implementers should be intensified on provision of basic facilities for wastes disposal as well as decent housing. Although about 95% of the population rely on ponds, wells and rivers as sources of water for daily use, there was no significant difference in rate of intestinal parasites among those who used tap water/bore hole and those who did not ($P>0.05$). Poor housing and poor sanitary conditions may probably have overshadowed all the health benefits which better water supply would bring to the community. Besides, the irregular flow of these taps noted during the period of study would also affect regular accessibility of these "privileged" few to quality water supply, hence the tendency for the whole community using the alternative sources with their health implications. These factors were also found to contribute to the high density of intestinal parasites in a refugee camp in Gaza strip, Palestine[17].

The high illiteracy level in the community was also found to be a driving force towards intestinal parasitic infestation. Adult formal and informal as well as the nomadic education specifically designed for this set of people should be revived and streamlined. Also the Nigeria's Universal Basic Education (UBE) programme should be expanded to accommodate the nomadic Fulanis in Kuraje village as well as other Fulanis in the vast rural communities in north west and entire north Nigeria. Health education should be an integral part of all the literacy campaigns so as to effect the desired positive changes and attitudes among the people.

However, the findings from the present study are different from the findings in Ethiopia[18], Ghana[19,20], and Calabar, Nigeria[21] where varying rates of *Crytosporidium parvum*, *Isospora belli*, *Microsporidium* and *Balantidium coli* were recovered from various stool specimens. Although most of these findings were from patients with gastrointestinal symptoms and majority seropositive for HIV, some of these parasites probably would have been detected if specifically looked out for. This limitation is nevertheless acknowledged. In conclusion, this study has shown that, the rate of intestinal parasites infection in Kuraje village is still high. Lack of standard sanitary facilities, poor housing facilities, lack of potable water and high illiteracy rate were found to be the main propelling factors. Efforts should be intensified towards provision of potable water, good housing, standard sanitary facilities as well as improvement in quality and scope of adult mass literacy programme with health education. These should be closely monitored with periodic evaluation in order to ensure a worm free community which is not really an impossible mission.

Conflict of interest statement

We declare that we have no conflict of interest.

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