Original Article

Risk Factors for Intestinal Parasitosis among Almajiri Pupils in Zaria, North Western Nigeria

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Abstract

Context: Intestinal parasitosis is an infection by intestinal parasites and is of important public health concern in the tropics and subtropics. The Almajiri pupils have peculiar characteristics in the community that predispose them to intestinal parasitosis. **Aim:** To assess the risk factors for intestinal parasitosis among Almajiri pupils in Zaria, North Western Nigeria. **Settings and Design:** The study was undertaken in Zaria town of Kaduna State, North Western Nigeria. Cross-sectional analytical design was used for this study. **Subjects and Methods:** A structured questionnaire was used to obtain data on 262 consented participants drawn by multistage sampling technique. Sociodemography, risk factors for intestinal parasitosis, and stool examination findings of the study participants were assessed. **Statistical Analysis Used:** Descriptive and inferential statistics were used to analyze the data. *P* values <0.05 were considered significant. **Results:** The prevalence of intestinal parasitosis among the pupils was 83.2%. Statistically significant relationships were found between having intestinal parasitosis and being an older pupil ($P = 0.008$), poor hand washing practices after defecation ($P = 0.042$), habit of biting finger nails/thumb sucking ($P = 0.003$), two or more pupils eating together from the same bowl ($P = 0.003$), and belonging to a polygamous family ($P = 0.009$). **Conclusion:** There was a high prevalence of intestinal parasitosis with many of its risk factors such as poor personal hygiene identified among the Almajiri pupils in Zaria. It is recommended that public health promotion, improved personal hygiene, and including the Almajiri pupils in mass deworming exercises are emphasized.

Keywords: Almajiri pupils, Almajiri school, infection, intestinal parasites, intestinal parasitosis, risk factors, Zaria

Introduction

Intestinal parasites are an important public health concern in the tropics.[1,2] Infectivity and endemicity of intestinal parasitosis depends on reduced access to clean water, poor sanitation and personal hygiene as well as prevailing negative behavioural and environmental conditions.[3,4] Intestinal parasitosis causes stunted growth, iron deficiency anaemia, malaise, reduced physical and mental activity.[1,3]

The word '*Almajiri*' is derived from the Arabic word '*Almuhajirun*' meaning migrants. It refers to a traditional method of acquiring and memorising the Glorious Qur'an (Koran) in Hausa/Fulani land where children are drawn from different parts of Northern Nigeria to learn and be trained in Islamic religion under the leadership of Mallams (Islamic instructors-/scholars).[2] Almajiri pupils study the holy Koran far away from their parents and have to fend for themselves. They enter the system at very tender age, staying all through in the school and occasionally return home during the rainy season to help their parents with farming. They usually exit the programme as they get married. They have peculiar characteristics such as being far away from their parents, poor personal hygiene, living in overcrowded rooms and had have to beg for what they eat every day.[5] These characteristics predisposes them to intestinal parasitosis and studies among them are dearth.

The study aimed to assess those risk factors for intestinal parasitosis among these peculiar population.

Subjects and Methods

All Almajiri pupils in Zaria town between 4 and 12 years of age were eligible to participate in the study. Very sick children

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and those who were dewormed 6 months before the study were excluded. A cross-sectional analytical design was used in conducting this study. A multistage sampling technique was used to recruit 262 pupils from 6 of the 13 political wards in Zaria for the study. The sampling stages were as shown below:

Stage I: Almajiri schools in each of the political wards were enlisted and a headcount of the pupils was conducted.

Stage II: Recruitment of Almajiri pupils from political wards by proportion.

Stage III: Recruitment of Almajiri pupils from each Almajiri school by proportion.

Stage IV: Particular pupils recruited from each school were selected using simple random sampling technique by balloting.

A structured interviewer-administered questionnaire was designed to collect information on the sociodemographic characteristics of the pupils and risk factors for intestinal parasitosis, as well as findings on macroscopic and microscopic examination of stool samples. Koranic education in this study means having solely Koranic system of education. In this study, poor hand washing means sometimes and never washing hands after defecation, whereas good hand washing mean always washing hands after defecation. The study definition of intestinal parasitosis is isolation of ova, larva, cysts, trophozoites, or adult worm of any species of intestinal parasites.

The children were asked to pass a little amount of stool on a clean plain sheet paper of A4 size and then transferred into a clean, wide screw capped, transparent, dry, and disinfectant-free container. The stool specimens were immediately examined at the site. An applicator was used to mix about 0.5 mg of feces from each stool sample collected and one or two drops of normal saline were placed on a clean glass slide. A uniform thin suspension was made and covered with 22 mm Samara cover slip and examined under a binocular light microscope at ×40 and ×100 magnifications. The entire film of each of the slides was screened systematically for protozoans and helminthic organisms by species.

Data were analyzed using IBM® Statistical Package for Social Sciences (SPSS®) version 20.0 software.[6] Findings were presented in frequency tables. Chi-square tests and bivariate logistic regression analyses were used to evaluate relationships between variables. A *P* value less than 0.05 was considered significant.

Ethical clearance was obtained from the Health Research and Ethics Committee of the Ahmadu Bello University Teaching Hospital, Zaria. Permission was obtained from the local authority overseeing the schools. Assent was given by the pupils and consent obtained from their teachers (Mallams). Confidentiality of all information was maintained.

Results

The mean age of the pupils was 9.44 years with a standard deviation of 1.95 years. Table 1 shows that most of the pupils constituting 133 (50.8%) were within the age group of 10–12 years. It was found that pupils with older age were more likely to have intestinal parasitosis (*P* = 0.008 linear-by-linear association value = 7.105 at 1 df). Most of the mothers of the pupils, 121 (46.2%), had Koranic education. This was followed by those with primary education constituting 67 (25.6%) mothers. Thirty-nine (14.9%) mothers had no formal education. Lower educational level of the pupils' mothers was statistically significantly associated with intestinal parasitosis (*P* = 0.037).

Trading was the most common occupation of the fathers of the study participants who constituted 115 (43.9%). This was followed by farming in 94 (35.9%) fathers. Six (2.3%) fathers were not gainfully employed. Those whose fathers were traders were more likely to have intestinal parasitosis than those who were farmers or artisans. This was statistically significant (*P* = 0.045; likelihood ratio value = 9.757 at 4 df). Most of the pupils, 176 (67.2%), came from a monogamous family setting, whereas 86 (32.8%) came from a polygamous family. Pupils coming from a polygamous family had a greater likelihood of having intestinal parasitosis (*P* = 0.009, chi-square value = 6.862 at 1 df). The prevalence of intestinal parasitosis among the Almajiri pupils in this study was 83.2%.

Table 1 shows that well water was the most common source of drinking water of the pupils. It was used by 158 (60.3%) of pupils who had intestinal parasitic infection. Forty pupils (15.3%) who had intestinal parasitosis drank pond or surface water. The different sources of drinking water used by the pupils were not significantly associated with likelihood of having intestinal parasitosis (*P* = 0.357; likelihood ratio = 4.383 at 4 df). Intestinal parasitosis was found in 114 (43.5%) pupils who only sometimes washed their hands after defecation. Only 76 (29.0%) pupils always washed their hands after defecation. Pupils who had poor hand washing practices after dfaecation were most likely to have intestinal parasitosis than those who washed their hands. This was statistically significant (*P* = 0.042; likelihood ratio = 6.351 at 2 df).

Out of the 63 (24.8%) pupils who had the habit of nail biting and thumb sucking, 60 (95.2%) had intestinal parasitosis. Pupils with the habit of biting their finger nails and thumb sucking were more likely to have intestinal parasitosis than those who did not. This was statistically significant (*P* value of 0.003; chi-square value = 8.593 at 1 df).

Most of the pupils, 141 representing 53.8%, ate together in groups of two to three. Out of these pupils, 129 (91.5%) had intestinal parasitosis. Thirty-three (12.6%) pupils ate together in groups of more than five. Pupils eating together in larger numbers were more likely to have intestinal parasitosis than those who ate alone. This was statistically significant (*P* = 0.003; linear-by-linear association value = 8.538 at 1 df).

Other risk factors such as the type of toilet used (*P* = 0.685), walking barefooted (*P* = 0.296), eating from food

Table 1: Risk factors for intestinal parasitosis among Almajiri pupils (n=262)

Variable	Intestinal parasite present		Total	df	χ^2	P
	Yes no. (%)	No no. (%)				
Age groups (years)				2	7.105†	0.008*
4-6	23 (74.2)	8 (25.8)	31			
7-9	76 (77.6)	22 (22.4)	98			
10-12	119 (89.5)	14 (10.5)	133			
Family type				1	6.862	0.009*
Monogamous	139 (79.0)	37 (21.0)	176			
Polygamous	79 (91.9)	7 (8.1)	86			
Father's occupation				4	9.757‡	0.045*
Civil	23 (88.5)	3 (11.5)	3			
Artisan	16 (76.2)	5 (23.8)	5			
Trading	102 (88.7)	13 (11.3)	13			
Farming	71 (75.5)	23 (24.5)	23			
Not gainfully employed	6 (100.0)	0 (0.0)	0			
Source of drinking water				4	4.383	0.357
Pond or surface water	34 (85.0)	6 (15.0)	40			
Well	158 (79.3)	35 (20.7)	193			
Borehole	5 (55.6)	4 (44.4)	9			
Tap water	15 (83.3)	3 (16.7)	18			
Packaged water	2 (100.0)	0 (0.0)	2			
Hand washing after defaecation				2	6.351	0.042*
Never	28 (82.4)	6 (17.6)	34			
Sometimes	114 (78.6)	31 (21.4)	145			
Always	76 (91.6)	7 (8.4)	83			
Habit of nail biting and ts				1	8.593	0.003*
Yes	60 (95.2)	3 (4.8)	63			
No	158 (79.4)	41 (20.6)	199			
Number of persons et				1	8.538	0.003*
Alone	24 (82.8)	5 (17.2)	29			
2-3	129 (91.5)	12 (8.5)	141			
4-5	41 (69.5)	18 (30.5)	59			
>5	24 (72.7)	9 (27.3)	33			

*Significant P<0.05; †Linear-by-linear association; ‡Likelihood ratio; ts: Thumb, sucking; no.: Number/frequency; et: Eating together

Table 2: Bivariate logistic regression analysis of socio-demographic and risk factors that were statistically significantly associated with intestinal parasitic infection among the study participants

Variable	B	S.E.	Wald	df	Sig.	Odd ratio	95% CI for odd ratio
Age group	-0.73	0.27	7.43	1	0.006*	0.484	0.287-0.816
Family type (polygamous)	1.513	0.472	10.268	1	0.001*	4.539	1.799-11.448
Hand-washing after defaecation (Sometimes)	1.133	0.474	5.71	1	0.017*	3.106	1.226-7.871
Nail biting	-1.958	0.66	8.791	1	0.003*	0.141	0.039-0.515
Number of persons eating together	0.536	0.221	5.865	1	0.015*	1.709	1.108-2.636
Constant	-3.166						

*Sig: Statistically significant P<0.05; df: Degree of freedom; CI: Confidence interval; B: Beta coefficient; S.E.: Standard error

vendors (P = 0.225), and involvement in farming (P = 0.963) were not statistically significantly associated with intestinal parasitosis. Table 1 shows the risk factors for intestinal parasitosis among the study participant.

Bivariate logistic regression analysis showed that the independent risk factors for intestinal parasitosis among the Almajiri pupils were being an older pupil, coming from a polygamous family, poor hand washing practices, and eating together in large numbers. Table 2 shows the logistic regression analysis of intestinal parasitic infection and its risk factors.

Discussion

The mean age of the pupils was 9.44 years with 50.8% within the age group of ten to twelve years. Kabir *et al* in Kano and Yahaya *et al* in Jigawa State found the median age of the Almajiri students to be 11 years.[7,8] This was in contrast to

the study by Zakir *et al* in Sabon-Gari, Kaduna State who found that the average age of the Almajiri students was 14 years.[5] It was found in this study that the older pupils were more infected with intestinal parasites than the younger pupils. This was a similar finding by Abbossie *et al* in Ethiopia. It was explained that the older children were more likely to explore the environment and get exposed to the intestinal parasites than the younger children risking infection by the parasites.[9]

A high prevalence of intestinal parasitosis of 82.3% found in this study was similar to the findings by Damen in North-Eastern part of Nigeria as well as Iduh *et al* among the 'Almajiris' in Sokoto.[2,10] The prevalence in this study could have been higher than what they reported if the concentration method that is more sensitive compared to the direct saline method was used in identifying the parasites.

A study by Ebhodaghe *et al* among students attending boarding schools in Ebonyi, Nigeria reported that sources of drinking water, hand washing habit and open field defaecation are significantly associated with intestinal parasitic infections.[11] It was a similar findings by Alaofe *et al* in two boarding schools in southern Benin republic.[12] In this study however, sources of drinking water were not statistically significantly associated with intestinal parasitosis. This was unexpected because most of the Almajiri pupils do not have a dedicated source of water at their Malam's (instructor's) house and while they roam the streets begging, they have no reliable, regular and clean source of drinking water.

In this study, 32.8% of the children came from polygamous families. Coming from a polygamous family was found to be statistically associated with intestinal parasitosis. Thobejane *et al* in 2014 reported that large polygamous households are associated with low resources per head, which adversely impact on child health and survival.[13] One of the main reason these children were sent far away from their parents to participate in the Almajiri system was because of poor economic capacity to cater for them with many of them coming from polygamous families. The poor living conditions at their homes may have predisposed them to intestinal parasitic infections even before coming to the Almajiri schools.

Poor hand hygiene after defaecation contaminates the hand with ova of the parasites and become easily transmissible orally. Infected children could contaminate the food as they ate together from the same bowl, thus risk infecting others. This is in agreement with reports in other studies.[11,14] Nail biting and thumb sucking can result in outright inoculation of the intestinal parasite.[8] Alum *et al* in 2010 reported that finger sucking habit was positively correlated with E. vermicularis infection because the ova of the parasite could have been deposited in the grown finger nails and get ingested.[15] The attitude of nail biting and fingers sucking among some of the Almajiri pupils could have added to the high prevalence of intestinal parasitosis among them.

Conclusion

A high prevalence of intestinal parasitosis was found among the Almajiri pupils in Zaria. The majority of the children came from families with low educational and socioeconomic status.

To reduce the burden of intestinal parasitosis, proper sewage disposal and personal and environmental hygienic practices should be inculcated in the Almajiri system. Broad-spectrum antihelminthics and chemotherapeutic antiprotozoan drugs should be provided to the pupils. This could reduce the reservoir of parasites in the community.

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Conflicts of interest

There are no conflicts of interest.

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