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Prevalence of Intestinal Parasitic Helminths from Fingernails of "Almajiris" in Birnin Kudu Local Government Area, Jigawa State, Nigeria

Abdullahi Yahaya[1*], Yakubu B. Tyav[1] and Aisha Idris[2]

[1]Department of Biology, Faculty of Science and Science Education, Kano University of Science and Technology, P.M B. 3244, Wudil, Kano State, Nigeria.
[2]Department of Biological Sciences, Federal University, Dutse, Jigawa State, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Author AY did the study design and wrote the protocol. Authors AY and YBT did the statistical analysis and literature searches while analyses of study was by author AI. All authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

Aims: This study aimed to investigate the prevalence of intestinal parasitic helminth eggs in the fingernails of "Almajiris" in Birnin Kudu Local Government Area in Jigawa State, Nigeria and to determine the source of the infection as an indicator of the overall hygienic standard of "Almajiris" from such areas.
Study Design: Cross-sectional Survey.
Place and Duration of Study: The study area was Birnin Kudu Local Government Area in Jigawa State, Nigeria. However, the research was conducted in the Faculty of Science and Science Education, Department of Biology, Kano University of Science and Technology, Wudil, Nigeria between January 2014 and April 2014.
Methodology: The study was conducted among Qur'anic school pupils (Almajiris) attending three

**Corresponding author: Email: yahayabdul@yahoo.com;*

different Qur'anic schools in Birnin Kudu, Jigawa state. Simple random sampling technique was employed in selecting the 383 "Almajiris" (age ranges from 7 years to 30 years) recruited for this study. Swab samples from the fingernails were subjected to Salt Floatation Technique and the nail clippings were analyzed using concentration method and eggs of parasites were identified by characteristic egg morphology using standard procedures.

Results: The prevalence of intestinal parasitic helminthes among the overall population studied was 54.8% (210 of 383). The parasites isolated from the fingernails of the Almajiris are: 29.5% *Ascaris lumbricoides*, 24.3% Hookworm, 19.0% *Enterobius vermicularis*, 8.1% *Trichuris trichuria* as well as mixed infections involving *Ascaris lumbricoides* and Hookworm, 6.7%; Hookwom and *T. trichuira*, 5.7%; *Ascaris lumbricoides* and *Enterobius vermicularis*, 4.2% and that between *Ascaris lumbricoides*, *Enterobius vermicularis* and *Trichuris trichuria*, 2.3%. The difference between the intestinal helminths was not significant (P-value = 1.00). There were significant variation in relation to the infection among the three qur'anic schools (P-value=.001). Age group between 11-15 years had the highest infection of 60.2% but this was not significant (P-value = 1.00).

Conclusion: The study revealed high prevalence of intestinal helminth parasites in the fingernails of "Almajiris" and if not controlled, it may cause colossal health challenges to the community. This underscores the importance of teaching hand washing and personal hygiene to "Almajiris" and their teachers, otherwise known as "Malams" as well as inculcating the habit of periodic deworming exercise.

Keywords: Almajiris; Birnin Kudu; fingernails; intestinal helminthes; malams; qur'anic.

1. INTRODUCTION

Infections with intestinal parasites are becoming pandemic thus presenting monumental public health consequences; hence, the call for global health concern. This menace has become more prevalent and exacerbating among children in the third world nations. Some of the striking consequences of intestinal parasitic infections among children in developing nations include: Vitamin A deficiency, malaise, haemoglobin dysfunction, poor growth, iron deficiency anaemia, retarded physical activity and impaired mental functions [1,2].

The rate of mortality as a result of infections with intestinal parasites has risen to 3.5 billion people whereas the morbidity rate stands at 450 million people [3]. From 1998 to 2002 only, a startling average of 1,329 food-borne epidemics was reported to the Center for Disease Control and Prevention (CDC) each year [4]. Soil-transmitted intestinal parasitic helminthes are lethal and are among the ten most prevalent infections in on the globe [5]. It has been estimated by the World Health Organization (WHO) that about 270 million pre-school and aout 600 million school children in the third world countries live in areas where the helminth parasites are endemic and are easily transmitted. Thus, such areas are in dare need of treatment and preventive interventions [6]. Moreover, intestinal parasites have a cosmopolitan preponderance. However, their endemicity depends on parameters like socio-demographic factors, poverty, reduced access to adequate sanitation, lack of potable water, illiteracy, local customs such as the use of human and animal fertilizers, lack of access to modern healthcare facilities, and prevailing climatic as well as environmental conditions [7-9]. Local customs such as the use of human and animal fertilizers are also contributing factors.

Intestinal parasites adhere to fingers, fruits, vegetables, work instruments, door handles and money exchange [10]. Also, these helminth parasites can be transmitted by vectors like flies [5]. However, their adherence to fingernails is a latent source of infection [11]. Thus, the presence of intestinal parasites in fingernails is an indication of one of the major routes of transmission of the parasites. Indeed, it is a clear indication to the presence of an active infection or a source of parasitic infections. Obviously, it is an unarguable sign of poor personal hygiene, which is usually associated with children from rural areas. Consequently, these children portend a vibrant source of transmission to the entire community through sharing of common equipment in school, playing with one another and autoinoculation by means of finger biting and sucking, which is common among children of a peer age group. In developing countries however, intestinal parasites have been known to cause significant morbidity and mortality. The faecal-oral route is significant in the transmission of parasitic infections to humans via poor

personal hygiene. By the time soil becomes contaminated with intestinal parasites, the eggs in the soil can be transferred onto vegetables, door handles, etc and onto the hands, through which it is then transferred to the mouth and finally down to the gut [12,13]. However, the role of intestinal helminths parasite in causing morbidity and as well as in the pathogenesis of other infectious diseases differs from species to species. Similarly, the distribution and prevalence of various species also differs from one region to another because of several environmental, social and geographical factors. Consequently, it is evident that the major health problems encountered in most qur'anic schools in the study area are rooted in Malams and their pupil's having little meaning of orthodox medicine despite their access to health care facilities; even though their religion encourages personal hygiene and cleanliness as it is portrayed in their manner of prayers (Ablution).

This study aimed to investigate the prevalence of intestinal parasite eggs in the fingernails of [a*] "*Almajiris*" in Birnin Kudu Local Government Area in Jigawa State, Nigeria and determine the source of the infection as an indicator of the overall hygienic standard of "*Almajiris*" from such areas.

2. MATERIALS AND METHODS

2.1 The Study Area

Birnin Kudu is a Small town and a Local Government Area in the south of Jigawa State, Nigeria (Fig. 1). The Local Government Area is located 41Km from the state capital and some 120Km south-east of Kano [14]. It is situated at 11.45° North latitude, 9.5° East longitude and 474m elevation above the sea level [15]; and has an estimated population of 313, 373 [16]. The climate is semi arid, characterized by long dry season and short wet season. The climatic factors vary considerably over the year and are sharply inconsistent. The temperature out regime is warm to hot. The mean annual temperature is about 25°C but the mean monthly values range between 21°C in the coolest month and 31°C in the hottest month. Wet season is roughly four months (June to September) and dry season is seven to eight months (October to May). The rainy season may commence in May, but early rains in April are most common. The bulk of the rainfall comes in June through September. Violent dust storms are usually accompanied by tornadoes and lightening, which usually precede the onset of the rains in May / June and their retreat in September or earlier than that [17]. Most of the state falls within the in Sudan Savannah vegetation belt, but traces of Guinea savannah vegetation are found in parts of the southern districts. Extensive open grasslands, with few scattered stunted trees, are characteristics of the vegetation. The major occupation of the inhabitants is farming, Cattle rearing and fishing.

2.2 Study Population

The study was exclusively conducted on Qur'anic School pupils (Almajiris) attending three different Qur'anic Schools in Birnin Kudu, Jigawa State (North-Western Nigeria). Simple random sampling procedure was used in selecting the "*Almajiris*" recruited for this study. Three Qur'anic schools were studied and were labeled as A, B, C. The numbers of "Almajiris" from each of the schools are 135, 127 and 121 respectively. A total of 383 "Almajiris" were enlisted for this study. The age of the participants ranges from 7 years to 30 years.

2.3 Sample Collection

Test samples were obtained from the fingernails of the *"Almajiris".* The nails were swabbed into a clean sterile container containing normal saline. Fingernail clippings were collected from both hands of each subject using sterile nail clippers and placed in labelled containers containing normal saline solution.

2.4 Laboratory Analysis

A drop of mixture of the swabbed sample with normal saline was transferred using a sterile plastic Pasteur pipette to the centre of clean grease-free slide and carefully covered with a clean cover slip in order to avoid air bubbles and

Footnote: a The name, which is most famous in Northern Nigeria, was coined for the students of Qur'anic education, in view of their habitual emigration from their original hometowns to other places or to a popular teacher, settling in a different town for sound and pristine Qur'anic education. "Almajiri", is a general nomenclature given to both students and the destitute, but with different meanings attached to each. Whereas "Student Almajiri" is meant exclusively for Qur'anic students; the "Destitute Almajiri" is mainly a habitual as well as perpetual beggar (whether child or adult). Ordinarily, the "Student Almajiri" is not meant to beg, but when pushed by the forces of livelihood - since he fends for himself, he alternatively resorts to begging for alms and food, though only at specified times (that is after school break or on school-free days), for sustenance. Unlike the "Destitute Almajiri" (beggar) who only stops begging when it is bedtime. (http://www.gamji.com/articles8000/NEWS8006.htm).*

over floatation. Direct microscopic examination of the samples for ova of helminthes was carried out using X10 and X40 magnification objectives, respectively. The nail clippings were immersed in 10% Potassium Hydroxide solution for 24 hours and subsequently centrifuged for 5 minutes at 2500rpm. The supernatant layer was discarded while the sediment of each specimen was stained with Lugol's Iodine and Eosin and subsequently examined under microscope using X10 and X40 magnification objectives, respectively. Eggs of parasites were identified by characteristic egg morphology - using standard procedures [18].

2.5 Statistical Analysis

The prevalence of parasites was presented as descriptive statistics while the relationship between several variables and the presence of parasites was determined using Chi square test. P<0.05 was considered significant at 95% confidence interval. Data analysis was performed using statistical programme for social sciences (SPSS) version.

3. RESULTS

The prevalence of intestinal parasites among the overall population studied was 54.8% (210 of 383). The parasites isolated from the fingernails of the qur'anic school pupils are; *Ascaris lumbricoides,* Hookworm, *Enterobius vermicularis* and *Trichuris trichiura*, with prevalence rates of 29.5%, 24.3%, 19.0% and 8.1% respectively. There was also mixed infections involving *Ascaris lumbricoides* and Hookworm, 6.7%; Hookwom and *T. trichuira*, 5.7%; *Ascaris lumbricoides* and *Enterobius vermicularis*, 4.2% and that between *Ascaris lumbricoides*, *Enterobius vermicularis* and *Trichuris trichuria*, 2.3% (Table 1). However, there was no significant difference between the prevalence of various intestinal helminthes (*P*-value=1.00). The prevalence of intestinal parasitic helminthes among the qur'anic schools studied is presented in Table 2. The results indicated that qur'anic school "A" had the highest overall intestinal parasitic helminthes infection of 61.5% as well as highest overall prevalence of *Ascaris lumbricoides* of 56.9% (*P*-value=.001) while qur'anic school "C" had the least overall prevalence of intestinal parasitic helminth infections as well as *Ascaris lumbricoides* infections of 48.8% and 12.5% respectively.

The age-related distribution of intestinal helminthes infections among the "*Almajiris"* in Birnin Kudu Local Government Area, Jigawa State is depicted in Fig. 2. The result showed that intestinal parasitic helminthes infection was at its peak (60.2%) within the age group of 11-15 years; whereas the age group of 26-30 years had the least (31.8%) and there was no significant difference between the prevalence of the infection in relation to age groups among pupils (*P*-value = 1.00).

Table 1. Prevalence of Intestinal Helminthes among Almajiris in three Qur'anic Schools in Birnin Kudu Local Government Area, Jigawa State, Nigeria

Parasite	No (%) detected
A. lumbricoides	62 (29.5)
Hookworm	51 (24.3)
E. vermicularis	40 (19.0)
Trichuris trichiura	17 (8.1)
A. lumbricoides+Hookworm	14 (6.7)
A. lumbricoides+E. vermicularis	9 (4.2)
Hookworm+*T. trichiura*	12 (5.7)
A. lumbricoides+E. vermicularis + *T. trichiura*	5 (2.3)
Total	**210 (100)**

N= 383

Table 2. Distribution of intestinal parasitic helminthes among "*Almajiris"* in three Qur'anic schools in Birnin Kudu local government area, Jigawa State, Nigeria

Qur'anic school	No. examined	No. infected (%)	*A. lumbricoides* no. (%)	Hookworm no. (%)	*E. vermicularis* No. (%)	*T. trichuira* No. (%)
A	135	83 (61.5)	41 (56.9)	28 (45.9)	21 (42.0)	13 (48.1)
B	127	68 (53.5)	22 (30.6)	11 (18.0)	16 (32.0)	5 (18.5)
C	121	59 (48.8)	9 (12.5)	22 (36.1)	13 (26.0)	9 (33.3)
Total	**383**	**210 (54.8)**	**72 (18.7)**	**61 (15.9)**	**50 (13.1)**	**27 (7.0)**

X^2=26.950, P<.05 (using Chi-square Test)

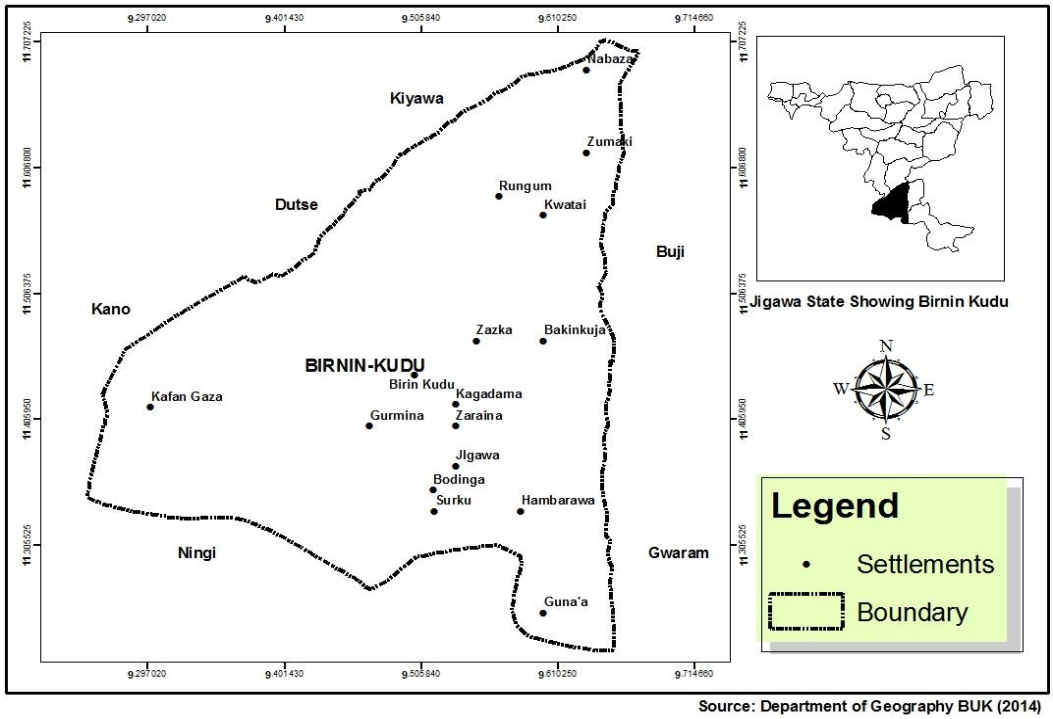

Fig. 1. The study area

4. DISCUSSION

Infections with helminth parasites present a major public health problem in poor and developing countries and have constituted global health as well as economic threat, which does not only depend on regional or ecological conditions, but also on the development of the people [19]. The biological control and prevention of intestinal infections, either by parasites or bacteria, requires an in-depth comprehension and knowledge of the epidemiological aspects of the problem, for guidance in the design of practical and economic control and prevention measures. Prevalence of intestinal parasites is largely due to poor personal hygiene and environmental sanitation, lack of potable water, poverty, ignorance of health promotion practices and poor health services [20]. Most common intestinal parasitic infections of man are faecal borne and their transmission occurs either directly from hand-to-mouth or indirectly through food and water. The transmission of these parasites within the community is directly related which are conferred on it by the outer chitanous layer of the egg shell and the laying of numerous eggs of about 2000 per day by the female worm. Moreover, it was observed that the study area lacked environmental and personal hygiene as well as absence of modern toilet facilities. Hence, to human habits with regards to personal hygiene, feeding habits, defaecation, cleanliness and level of education. Therefore, their prevalence in the community can be used as an indicator of the living conditions and environmental sanitation levels as well as the socioeconomic status of the community [20].

The present study revealed a high prevalence of intestinal helminth parasites (54.8%) and this is the first report of its kind in this study area. The result of this research is similar to those of [21-26] among others, as well as some parts of other countries such as Central Jakarta [20], where the there was high prevalence of intestinal helminth parasites amongst school pupils in other part of the country. It is however in contrast to a lower prevalence of 21% found among school children in Baglung, Nepal [27].

The higher prevalence of *Ascaris lumbricoides* recorded in this study is in concordance with previous reports of [8,26] and [28-31]. This could be attributed to its high survival strategies this might have tremendously contributed to the high prevalence rate of intestinal helminthes recorded in the area. It has been reported that lack of sanitary facilities, particularly latrine, would greatly determine the presence of roundworm in any given place [32]. In addition, it

is a known fact that most "*Almajiris*" are in the habit of defaecating in the surrounding bushes and mostly walking bare footed; hence brightening the chances of contamination and infestation. Similarly, they are fond of picking up food items from the ground where they are prone to be infested by soil transmitted helminthes.

The variations in the prevalence of the infection in different qur'anic schools studied could be associated with various factors involving the "*Almajiris*" themselves as well as the schools and its environment. It is a clear fact that the qur'anic schools studied, lack modern toilet facilities and even where the toilets are available; they appeared to be unclean and dilapidated as well as improper waste management system. Consequently, this necessitated indiscriminate defaecation in adjacent bushes; thereby colossally contributing to the prevalence of intestinal helminthes infection in the study area. Importantly, environmental sanitation plays a pivotal role in the transmission of most intestinal parasites.

Though not significant, the proliferation and high rate of intestinal parasitic helminthes infection observed within the age group 11-15 years could be attributable to the active nature of the age range. In fact, children of this age bracket tend to be more exposed to contaminated sites and eating food with unwashed hands whereas the older age group tend to be more selective in their choice of food and outdoor activities thereby reducing infection risks through good health habits.

The noticeable and relatively high prevalence of intestinal parasites in this study is an indication of poor personal hygiene of the "Almajiris". It is understood that hand -to-mouth helminthes transmission is the most effective means of transmission for most helminth parasites and hence this proved the low level of education on personal and hand hygiene of the pupils. Moreover, it was also observed that the parasite eggs were markedly lower among "*Almajiris"* with trimmed fingers.

Despite their high prevalence in developing countries, persons with intestinal parasites have very low morbidity and mortality rates, thus intestinal parasites are commonly viewed as low-priority health problems. However, Ascariasis caused intestinal obstruction in 5-35% of pediatric cases in a comparison of studies conducted throughout the tropics. The intestinal obstruction by Ascaris worms is often fatal. In addition, hookworm infection can cause iron deficiency anemia; and trichuriasis is associated with chronic dysentery and rectal prolapsed [33,34].

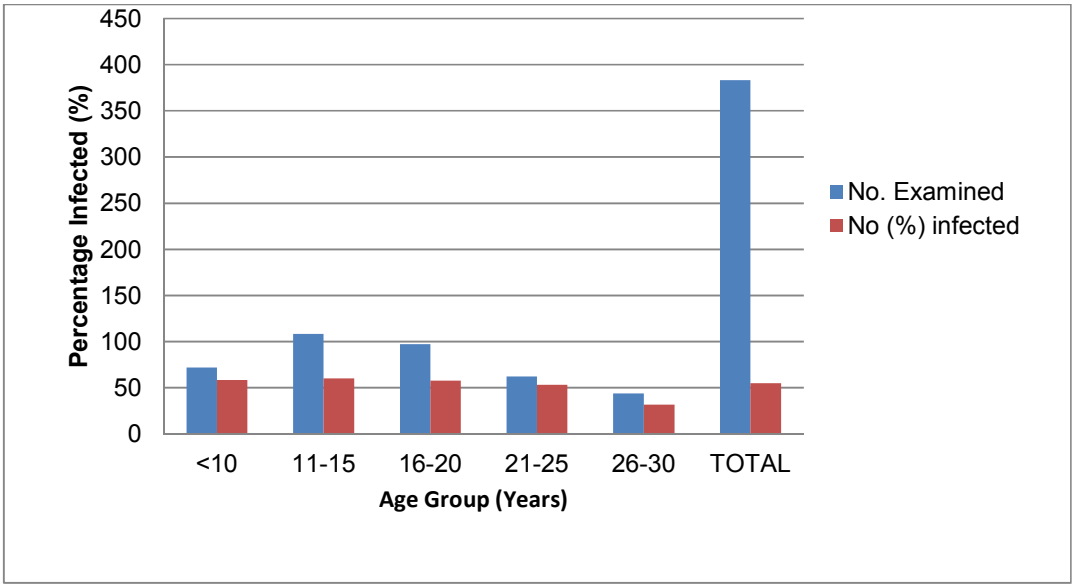

Fig. 2. Age-related distribution of intestinal parasitic helminth infections among Almajiri's in Birnin Kudu, LGA Jigawa state Nigeria

This study emphasizes the importance of teaching “Almajiris” and their teachers, otherwise known as "Malams", the habit of regular hand washing and personal hygiene as well as instilling the habit of periodic deworming exercise in them. It would be pertinent that potable water and efficient waste disposal facilities be provided in schools in most developing countries, especially those in rural areas, where there are almost no existing ones. This factors will tremendously mitigate the rate of transmission of these parasites to uninfected children and prevent autoinfection.

5. CONCLUSION

The study revealed high prevalence of intestinal helminth parasites in the fingernails of “*Almajiris”*; hence prompting proactive measures to avert the dastardly situation, which if handled with laxity, may result in colossal health challenges to the community. Therefore, the most effective means of preventing the transmission of these parasites include the followings: provision of good toilet facilities and waste management system; integration of deworming programmes into the existing health infrastructure; prompt treatment of infected persons as well as proper education on the need for good personal hygiene and regular hand washing habit.

CONSENT

Informed consent was obtained from the Heads / Malams of the schools studied as well as the “*Almajiris”*.

ETHICAL APPROVAL

Approval for the study was granted by the Birnin Kudu Local Government Area Education Secretary.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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