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Review Article –Public Health

Prevalence of helminthic infection among primary school children in some selected primary schools in municipal local government area, Kano state, Nigeria

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Abstract

The research was conducted to study the prevalence of helminthic infection among primary school children in some selected primary schools in municipal local government area, Kano state. A total of 100 hundred school children between the ages group of 6-12 years old were examined for intestinal helminth infections using direct wet method and formol-ether concentration technique. The samples were collected from both sexes and were processed. Of the 100 pupils examined, 72.0% were infected with one or a combination of the worms with *Ascaris* having the highest prevalence rate (31.0%) followed by hookworm (19.0%), *Schistosoma* (8.0%), *Enterobius* (8.0%), *Strongyloides* (6.0%) had the least rate of infection as shown in table 3. The prevalence of infection of helminth parasite among schools ranged between (A) 17(23.62%), (B) 14(19.4%), (C) 12(16.67%), (D) 15(20.83%), and (E) 14(19.44%) with no significant difference in the prevalence of infection between schools ($p>0.05$). Table 1 shows that out of 100 pupils examined, 40(40.0%) males and 60(60.0%) females respectively, of these 27(67.5%) males and 45(75.0) females were infected, the difference not significant ($p>0.05$). Of the 72 infected subject 17(23.6%) have multiple infection with 11(15.3%) and 6(8.4%) having double and triple infections respectively. *Ascaris* occur mostly with other helminth, *Ascaris lumbricoides+ hookworm and Ascaris +enterobius vermicularis+ hookworm* mostly were more common occurring combinations.

Keywords: Helminth, *Ascaris lumbricoides*, *Enterobius vermicularis*, hookworm , *Strongyloides starcularis*, *Schistosoma japanicum*, parasite, stool.

Introduction

Nigeria is the most populous country in Africa. This huge population coupled with the absence of basic social amenities, auspicious climatic environment and weak public health infra structure favor the transmission of helminth parasites. Intestinal helminths infections (*Ascaris, Trichuris* and Hookworm) in Nigeria remain as prevalent as they were in 1970s (Olaniyi *et al.*, 2007). Majority of those affected are young children between the ages of 5 and 14 years living in rural areas and urban slums. Cultural, socio-economic and environmental factors are major contributors to the persistence of these infections. Although world health organization (WHO) recommends chemotherapy for *Ascaris*, *Trichuris*, Hookworm, *Teania*, and *Enterobius* targeted at Nigeria as a feasible and cost effective control strategy, there is no policy-backed approach for helminths control in Nigeria. Parasitic worms are among the most common cause of chronic infection in humans; in developing countries it is more common to be infected than not (Awasthi *et al.*, 2003).

Infection thrives and persists in communities in need of better housing, clean water, and appropriate sanitation, better access to health care, education and increased personal earnings. This is typical of most rural communities and urban slums in Nigeria. People living up in these communities can expect to be infected and re-infected constantly for the rest of their life (Awasthi *et al* 2003). Helminth infection is a major cause of disease burden among children in developing countries (Olaniyi *et al.*, 2003), especially in sub Saharan Africa. This high infestation mirrors severe shortage in health care, education, transport and chronic poverty (Crompton, 1999).

Helminth infections are the most common and infective agents of mankind and are responsible for the morbidity and mortality throughout the developing world. The infection ranked highest in morbidity rate among school aged children who often present with much heavy worm infections because of their vulnerability to nutritional deficiency (D Ezeagwuna *et. al.*, 1990). Ova of helminth can also be isolated from underneath of fingernails of these children and on the surface of the Nigerian currency notes which they handle and also leak (Ekejindu *et al.*, 2005). These infections are major public health concerns because factors that predispose man to the infections are bound in the sub-region which includes poor environmental hygiene, poverty, malnutrition and ignorance (Ijabone and Olagunju, 2006). The rate of mortality as a result of infections with intestinal parasite has risen to 3.5 billion people whereas the morbidity rate stands at 450 million people. From 1998 to 2002 only, a startling average of 1,329 food borne epidemics was reported to the center of the disease control and prevention (CDC) each year. Soil-transmitted helminths thrive and persist in human communities in which poverty, inadequate sanitation, lack of access to health care, and overcrowding are entrenched. Additionally, habits of bare feet on sand and eating unwashed fruits and vegetables also encourage the transmission of helminthic infections. These habits occur in rural communities and urban slums in resource challenged and developing countries including Nigeria. The world Health organization (WHO) estimates that over two billion people are infected with one or more soil-transmitted

helminths, mainly *Ascaris lumbricoides*, hookworm, and *Tricuris trichura*. School aged children have been shown to be the population at greatest risk of acquiring infections with roundworm, hookworm, and whipworm infections. The preponderance of helminthic infection in school-aged children makes this subgroup a good target for helminth control programmes in general population and schools provide good opportunities for implementation of control programmes. Intestinal helminthiasis is often associated with reduced physical activity and may worsen the already compromised nutritional status of school-aged children in rural communities.

The prevalence of soil transmitted helminthiasis differs from region to region although several studies have been conducted on the prevalence of helminthiasis in Nigeria. In the past, there have been sporadic and uncoordinated deworming programmes instituted by politicians and philanthropists. This study sought to determine the prevalence and pattern of soil-transmitted helminthiasis. Soil-transmitted helminthes (STH) are mainly malicious, transmitted through soil, and are amongst the ten greatest shared infections in the sphere (Javeria *et al*., 2016*).*The most prevalent intestinal parasite was *Ascaris lumbricoides* (Javeria *et al*., 2016*). A. lumbricoides* and *Enterobius vermicularis* were the most communal species affecting human beings as also *A.duodenale* and *T. trichura. T.solium* and *T. saginatas* are other common cestodes. Intestinal parasites were blamed for producing some of the main infections all over the world like, amoebiasis, giardiasis, ascariasis, hookworm diseases and trichuriasis. These diseases are strictly connected to the low socioeconomic rank, deprived cleanliness, insufficient therapeutic care and lack of pure, drinkable water deliveries.

Intestinal parasites adhere to fingers, fruits, vegetables, work instrument, door handles and money exchange. Also, these helminth parasites can be transmitted by vectors like flies. However, their adherence to fingernails is latent source of infection. Thus, the presence of intestinal parasites in fingernails is an indication of one of the major routes of transmissions 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 fecal-oral route is significant in the transmission of parasitic infections to human via poor personal hygiene. By the time soil becomes contaminated with intestinal parasite, the eggs in the soil can be transmitted onto vegetables, door handles etc. and onto the hands, through which it is then transferred to the mouth and finally down to the gut. However, the role of intestinal helminths parasite in causing morbidity and as well as in the pathogenesis of other infectious disease 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 encounter in most primary schools are rooted in teachers and their pupil's having little meaning of orthodox medicine despite their access to health care facilities.

Materials and methods

Materials: Cotton wool, beaker, stool collection bottles, microscope, centrifuge, centrifuge tubes, formalin, di-ethyl ether, sieve, glass slide, cover slip, normal saline, iodine, stirrer

Study area: The study was carried out in Municipal local government area of Kano Urban Area in Kano State, Nigeria. Its headquarters is at Kofar Kudu (western entrance of emir's place), in the south of the city of Kano. It has an area of 17 km² and 13 wards with population of 365,525 at the 2006 census. The climate is semi-arid, characterize by long dry season. The climate factors vary considerably over the year and are sharply inconsistent. The temperature out regime is very hot. The mean annual temperature is about 25^0c but the mean monthly values range between 21^0c in the coolest month and 31^0c in the hottest month. The major occupation of the inhabitants is farming, trading and civil servants.

The Study Population: The study persons were primary school children aged from 6-12 years. Five primary schools were recruited for the study which serves as the representatives of the 13 word in municipal L.G.A. simple random sampling procedure was used in selecting the pupil's recruited for the study. The five primary schools were studied and labeled as A, B, C, D, and E.

Ethical Approval: Approval to carry out the study was obtained from local government educational authority of municipal local government area, kano state, universal basic education board. Written consent was obtained from Yusuf Maitama Sule University. Assent was also obtained from the children.

Collection of Stool Samples: Stool samples were collected from all the selected pupils in each school. The sample was collected around 10.00am and 1.00pm when most of the pupils were in attendance in the schools. All participating pupils would be supplied with a clean labeled plastic stool collection bottle with screw cap, a clean sheet of paper and a wooden spatula to transfer enough of the faeces on the sheet of paper and transfer the faeces into the plastic container and then cover the bottle tightly with screw cap.

Stool Analysis: Two methods were used to diagnose the stool samples, the direct wet mount and the formol-ether concentration technique Cheesbrough, M. (2000).

Formol-ether concentration technique

Procedure: A grape-sized pieces of faeces was passed into centrifuge tube, and 9ml of formalin was added and stir thoroughly, the mixture was sieved until all the debris is removed, 3ml of di-ethyl ether was added and shake vigorously for 10minutes, the tube was centrifuged (1500-2500) for 5 minutes. The supernatant was poured off, being careful to leave the sediment at the bottom of the tube intact and it was examined for eggs microscopically.

Direct wet mount faecal examination

Procedure: A drop of stool sample was applied to a small area on a clean grease-free slide and immediately before the

Table 1: Prevalence of helminth infection among primary school children in some selected primary school in municipal local government area, Kano state.

Schools	No examined (%)	No infected (%)	Parasite Encountered	Prevalence
Dan agundi pri sch	20(20)	17(23.62)	*Ascaris*, hookworm	89
Kwalli pri sch	20(20)	14(19.44)	*Strongyloides*, *Ascaris*	70
Hudaibiyya pri sch	20(20)	12(16.67)	*Enterobius, Ascaris, hookworm*	60
Kofar kudu pri sch	20(20)	15(20.83)	*Schistosoma*	75
Gandun albasa pri sch	20(20)	14(19.44)	*Ascaris, strongyloides*, hookworm	70
Total	20(100)	72(100)		390

Table 2. Prevalence of Helminth parasites among pupils according to schools.

S/N	Schools	No. examined	Ascaris	Hookworm	Enterobirus	Schistosoma	Strongyloides
					%		
1	Danagundi	20(20)	9(45.0)	5(35.0)	2(10.0)	0(0.0)	1(5.0)
2	Kwalli	20(20)	6(30.0)	5(25.0)	1(5.0)	0(0.0)	2(10.0)
3	Hudaibiyya	20(20)	4(20.0)	3(15.0)	2(10.0)	2(10.0)	1(5.0)
4	Kofar kudu	20(20)	7(35.0)	2(10.0)	1(5.0)	3(15.0)	2(10.0)
5	Gandun albasa	20(20)	5(25.0)	4(20.0)	2(10.0)	1(5.0)	2(10.0)
Total		100(100)	31(31.0)	19(19.0)	8(8.0)	6(6.0)	8(8.0)

Table 3: Prevalence of Helminth Parasites with respect to Age group of pupils.

Age(Years)	No. examined	*E. vermicularis*	*A. lumbricoides*	*Hookworm*	*S. stercularis*	*S. japanicum*
6-7	40	4(10)	19(47.5)	10(25.0)	4(10)	5(15.0)
8-9	32	3(9.4)	8(25.0)	7(21.9)	2(6.25)	2(6.25)
10-12	28	1(3.6)	4(14.3)	10(25.0)	0(0.0)	1(3.6)
Total	100	8(8.0)	31(31.0)	19(19.0)	6(6.0)	8(8.0)

Table 4: Number of children examined in each of the schools in relation to gender (sex)

Schools	No. examined (%)		No. infected (%)		Prevalence	
	Male	Female	Male	Female	Male	Female
Dan agundi	10(25.0)	10(16.7)	8(29.6)	9(20.0)	80	90
Kwalli	10(25.0)	10(16.7)	6(22.2)	8(17.8)	60	80
Hudaibiyya	8(20.0)	12(20.0)	5(18.5)	7(15.6)	62.5	58.3
Kofar kudu	10(25.0)	10(16.7)	6(22.2)	9(20.0)	60	90
Gandunalbasa	2(5.0)	18(30.0)	2(7.4)	12(26.7)	100	66.7
Total	40(100)	60(100)	27(100)	45(100)	67.5%	75.0%

Table 5: Poly-parasitism (multiple infection) in children of some selected primary schools in kano municipal L.G.A.

Parasite combination	Frequency (n)	% infection
Ascaris + Hookworm	8	11.1
E. *vermicularis*+ Hookworm + *Ascaris*	4	5.6
Hookworm + *S. japanicum*	3	4.2
Ascaris + Strongyloides stercularis	2	2.8
Total	17	23.6

specimen dries, 1 to 2 drops of saline or iodine was added with a pipette, mixed with an applicator stick, and it was carefully covered with a clean cover slip in order to avoid air bubbles and over floatation. Direct microscopic examination of the samples for helminths eggs was carried out using x10 and x40 magnifying objective lens respectively.

Statistical Analysis

The prevalence of parasites will be presented as descriptive statistics while the relationship between several variables and the presence of parasite would be determined using Chi square test, data analysis will be performed using statistical program for social sciences (SPSS) version.

The result of the study showed that school sample from a total of 100 primary school pupils comprising 40 males and 60 females, aged between 6 to 12 yrs were examined for intestinal helminth infections, *Ascaris lumbricoides*, hookworm, *Enterobius vermicularis, Schistosoma japanicum and Strongyloides stercolaris* were identified. of the 100 pupils examined (72.0%) were infected with one or a combination of the worms with *Ascaris* having the highest prevalence rate, (31.0%) followed by hookworm (19.0%), *Schistosoma* (8.0%), *Enterobius* (8.0%), *Strongyloides* (6.0%) had the least rate of infection. this result is shown in table 3 the findings ofhighest occurence of *A. lumbricoides* infection more than hookworm is common in a study like this. The prevalence of infecton of helminth parasite among schools ranged between (A)17(23.62%), (B)14(19.4%), (C)12(16.67%), (D)15(20.83%), and (E)14(19.44%) was no significant difference in the prevalenceof infection between schools ($p>0.05$).

Table 1 shows that out of 100 pupils examined 40(40.0%) males and 60(60.0%) females respectively, of these 27(67.5%) males and 45(75.0) females were infected. the difference not significant ($p>0.05$). Of the 72 infected subject 17(23.6%) have multiple infection with 11(15.3%) and 6(8.4%) having double and triple infections respectively. *Ascaris* occur mostly with other helminth, *Ascaris lumbricoides*+ hookworm and *Ascaris* +*Enterobius vermicularis*+ hookworm mostly were more common occurring combinations. This result is shown in table 4.

Discussion

Eggs of five helminth parasite, hookworm, *Ascaris lumbricoides, Enterobius vermicularis, Schistosoma mansoni and Strongyloides starcularis,* were recorded with 72(100%) infection. Of the 100 school children positive for one or more types of helminth. The overall prevalence of infection is (72%) when compared with reported studies of previous studies in other part of the country (Sam-wobo and Mafiana, 2004; Agbolade *et al*., 2004 Ugbomoiko *et al*., 2006) agreed with their findings but high when compared with (Okpara, 2007, and Dada *et al*., 1993), suggestive of the poor personal hygiene awareness and environmental sanitation in the study area and indefinite communal control efforts. Previous studies had also attributed the high endemicity to poor environmental and personal hygiene, shortage of good water supply and indiscriminate defecation. Hookworm and *Ascaris lumbricoides,* in contrast to other helminth had the highest prevalence of infection probably because their ova are resistant to environmental pressures.

However, the prevalence of Ascariasis and hookworm infections decreased with age 10 groups probably indicating maturity age and awareness of the existence of such diseases. Poor personal hygiene, supervision, voracious eating habit and activities linked with contaminated with infected intestinal helminth infections common in school children infected with this helminth are from homes in which goats, sheeps or rabbits are domestically reared and their faeces used as nature in domestic vegetable gardens. Mixed infection due to *Ascaris* and hookworm are often described as "umquitoes triod" which is in consonance with the findings of Onuoha et al., (2010) and Ali *et al*., 2011 among school children in Enugu and states respectively but differs from the report of Oyewolo *et al*., 2002 who observed high prevalence in co-infection among *Ascaris and Trichura* in Ondo state, Nigeria.

From an epidemiological perspective therefore the study underlying the fact that indiscriminate defecation, food and feeding habits amenities and awareness of the mode of transmission as well as low level of sanitation of the study areas are among the principal factors enhancing transmission of helminthiasis in the area studied. This situation calls for effective control measures in the community health education campaign aimed at influencing the attributes and behaviors of the population at risk regarding the consumption of well-cooked meat, maintaining a high standard sanitation and treating diagnosed cases. A similar recommendation has been made by Ogbani- Emovon *et al*., 2004. Prevention of these intestinal helminth infections is possible by restricting sheep, goat, and cattle from straying, avoiding bathing in infected streams and lakes and by maintaining personal hygiene.

Conclusion

The finding of high prevalence of helminth infection amongst primary school children in municipal local government area, Kano state, emphasise the need for potable water supply and safe disposal systems in schools, the need for provision of good toilet facilities and waste management systems, prompt treatment of infected persons as well as proper education on the need of personal hygiene and regular hand washing habit. There is also the need for routine regular deworming of all students in the schools to reduce the burden of intestinal helminthiasis and guarantee the delisting of the communities delisting of communities world health organization (WHO) "moderate risk area" classification status.

Recommendation

It was suggested that laying emphasis on personal and community hygiene can be achieved through promoting health education in addition to early diagnose and treatment of the infection especially among pregnant women, will go long way in checking the spread of this infection in our community especially due to its devastating effect in causing maternal death. Government should enhance the activity of poverty reduction programs. There is a need to promote mass scale deworming and health and hygiene. Therefore, an intervention strategy should be designed and implemented including provision of adequate and safe water supply, regular deworming and health education on personal hygiene to the students and to the parents. Also, the finding of high prevalence rates of helminths infection amongst primary school children, emphases the need for potable water supply and safe sewage disposal systems in schools. There is also a need for routine regular deworming of all students in the schools of municipal local government area to reduce the burden of helminthiasis and guarantee the delisting of the communities WHO "moderate risk area" classification status.

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