International Journal of Pure and Applied Zoology
Volume 3, Issue 3, pp: 232-239, 2015
http://www.ijpaz.com

ISSN (Print) : 2320-9577
ISSN (Online): 2320-9585
Rishan Publications

Research Article

PARASITOLOGICAL EVALUATION OF UN-DISPOSED REFUSE DUMPS IN CALABAR SOUTH, CROSS RIVER STATE, NIGERIA

Cletus Inah Iboh[1*], Okoi Enang Effiom[2], Stephen Christian Ekoro[3], Atting Inyang[4]

[1]Department of Biological Sciences, Cross River University of Technology, Calabar, Cross River State, Nigeria.

[2]Department of Biological Sciences, Veritas University, Abuja, Nigeria

[3]Nigeria Agric Quarantine Service, Enugu House, Abuja, Nigeria

[4]College of Medical Sciences, University of Uyo, Nigeria

Article History: Received 11th February 2015; Accepted 7th July 2015; Published 26th July 2015

ABSTRACT

For inhabitants to appreciate clean environment there is need to examine the distribution and effects of parasites in refuse dump stands at different locations in Calabar city. The parasitological investigation of refuse dumps in Calabar South of Cross River State, Nigeria, was carried out in randomly selected eight refuse dump stands between August 2012 and September 2014. One hundred grams (100 g) of refuse sludge taken from each of the eight refuse dump stands was examined through standard parasitological processing to search for parasites. Out of 320 refuse sludge investigated, 495 parasitic eggs/cysts were recovered from different locations of dump stands in the city. These parasites were divided into four groups (Nematodes, Rhizopods, Ciliates and Trematodes) made up of seven species. The species were *Entamoeba histolytica*, *Ascaris lumbricoides*, *Enterobius vermicularis*, *Balantidium coli*, *Trichuris trichiura*, *Hookworms*, and *Schistosoma mansoni*. Entamoeba histolytica presented the highest prevalence rate of 64%. The overall intensity of parasite infestation was significantly higher in the residential than market areas ($p < 0.05$). To eradicate parasitic contamination of the area, public health education should be used to encourage sanitary environmental condition.

Keywords: Parasitological, Evaluation, Un-disposed, Refuse, Calabar South, Nigeria.

INTRODUCTION

The generation and disposal of refuse in the world and Nigeria in particular has become a major concern today (Bartone, 2000; Okoronkwo and Onwuliri, 1997). It appears to be a losing battle against the harmful consequences of unguided refuse collection and disposal and the attainment of clean healthy environment for all Nigerians. It has become a common sight in Nigeria today to see heaps of festering refuse dumps in our urban and commercial cities (Modebe *et al.*, 2011). These wastes are aesthetically unpleasant, constitute eyesores, produce unpleasant odours especially when their organic compositions are acted upon by putrefying bacteria (Onyido *et al*., 2009).The life style of most Nigerians today is a reflection of the consumption and solid waste generation pattern they have adopted (Sule, 2004). This has been shown in their attitudinal problem of indiscriminate solid waste disposal in all sides of residential apartments, drains, highways, corners of major and minor streets, undeveloped plots of land by many households (Akinwale, 2005). These un-disposed refuse dumps provide breeding grounds for biological vectors such as mosquitoes and rodents, that enhance disease transmission like malaria, diarrhoea, and lassa fever which are of public health concern (Sule, 2004; Park, 2007; Bassavanthappa, 2008; Onyido *et al.*, 2009). Lassa fever is haemorrhagic fever common in four West African countries, Guinea, Liberia, Sierra Leone and Nigeria. It is transmitted to humans through contact with food or household items contaminated with rodent excreta.

High prevalence rate of protozoan endoparasitic infections have been reported in

*Corresponding author e-mail: clenaboh@yahoo.com

different communities due to illiteracy, poverty, lack of personal hygiene and government lapses in the collection, treatment and disposal of refuse in developing nations (Eneanya and Anikwe, 2005; Onyido *et al.,* 2009). Rural communities and urban slumps in developing nations are known for persistent parasitic, bacterial and viral infections, because they lack portable water, appropriate sanitation methods, better housing, access to improved health care and better education (Gunduri and Okwuosa, 2006). Intestinal parasites are life threatening. In many developing countries, these are major international concern. It has been reported that transmission of the disease(s) is usually through poor hygiene during food preparation, use of night soil for watering of crops, oral-anal sexual practices and raw eating of vegetables and fruits (Adewole and Ajayi, 2010).

In Ado Ekiti, Nigeria, *Entamoeba histolytica* (65.5%), *Giardia lamblia* (42.4%) and *Balantidium coli* (1.9%) have been reported from faecal samples in refuse dumps (3). Cases of multiple intestinal parasites and bacterial agents have been found in sludge samples of refuse. Parasitic agents of both human and veterinary importance in sludge samples reported by (Adebayo and Akinbo, 2002) such as *Ascaris lumbricoides* (9.3 eggs per gram (egp), *Entamoeba histolytica* (8.07 egp), *Hookworm/Strongyle* (6.27 egp), *Ascaris suum* (1.07 egp), *Ascaris vitolorum* (1.09 egp), *Strongyloides paillosu* (0.59 larvae per gram.), *Schistosoma suis* (0.31 egp) and *Dicrocoelium dendriticum* (0.9 egp) Bacterial agents encountered these authors were *Klebsiella species*, *Escherichia coli*, *Proteus species* and *Streptococci.*

In Nigeria, parasitic diseases commonly associated with refuse dumps include malaria, amoebiasis, filariasis, myiasis, ascariasis, taeniasis, hookworm infection and others (Duncan, 1985). Calabar, being a densely populated town due to the establishment of two universities with various human activities, has numerous refuse dump stands scattered on the streets. Nuisance from un-disposed refuse dumps on the streets like stench, eyesore, filth, mosquitoes, flies, cockroaches, and rats are quite discomforting and health threatening. Although veterinary and medically important parasitic agents have been isolated from refuse dumps and abattoir in some parts of Nigeria, there is dearth of information on the parasitic status of refuse dumps in Cross River State, especially in Calabar south.

The objective of this study was to investigate parasitic agents in un-disposed refuse dumps on the streets of Calabar South, Cross River State, Nigeria.

MATERIALS AND METHODS

The study area

This study was conducted in Calabar South Local Government Area (LGA) of Cross River State, Nigeria. Calabar is one of the largest cities in Nigeria and densely populated with various categories of peasant farmers, traders, artisans, private business men and civil servants. Calabar is the capital of Cross River State in Nigeria, located between longitude 4^{o} 57'O'' and latitude 8^{o}19'O''.

Sample location

Eight refuse dump stands on the streets of Calabar South LGA were randomly selected for this study, located at Ekpo-Abasi, Yellow Duke, Mayne Avenue, Mount Zion, Watt Market, New Airport Road, Goldie Market, and Musaha.

Composition of refuse dumps

The refuse dump stands differed in age, size and composition. Some were large deposits of refuse accumulated over two months, while others are smaller and more recent. Majority were made up of waste papers, metal tins, decayed vegetables and fruits, rotten food materials, human and dog faeces. Others were composed of plastics, decaying tomatoes, onions, rotten meat, empty water sachets, rotten fowl and pigs' intestines.

Sample collection

A total of 320 refuse sludge (soft mud) was collected in the eight refuse dump stands in the study area. Each of the dump stands was visited five times for sample collection. In each of the visit, 8 grams of refuse sludge samples were collected with the aid of a metal spatula into screw-caped rubber vials. This gave 40 grams of refuse samples. Samples were collected only in the morning hours when the refuse was damp, between 7.30 am and 8.30 am.

Sample processing

The method described by Adeyeba and Akinbo (2002) was used to process refuse sludge to search for parasites. One hundred grams (100 g) of refuse sludge taken from each of the eight refuse dump stand was passed through a coarse sieve of 4mm^2 pore size to remove stones, grass and other undesirable materials. The preparation was then transferred into the volumetric flask. To each volume of refuse, 2 volumes of 30% sodium hypochlorite was added to disinfect the sample, stirred and allowed to stand for 30 minutes. The mixture was then diluted to the mark and mixed again. The coarse particles were strained out by passing through a coarse mesh clothe into a centrifuge tube and centrifuged at 3000 rpm for 2 minutes. The supernatant was discarded and the deposit re-suspended in magnesium sulphate floatation fluid of specific gravity of 1.3 and then centrifuged again at 3000rpm for another 2 minutes. The supernatant was also discarded and a drop of the deposit was placed on a microscope glass slide and viewed under a compound microscope to detect worms, cysts, eggs, and larvae using x10 and x40 objectives.

Data analysis

Chi square (x^2) test was used to determine the significant difference of parasite infestation between residential and market dump stands. P-values $p<0.05$ were considered statistically significant. Geometric mean intensity of a parasite was calculated as antilog (E log(x+1)/n) with x being the number of parasites collected, and n the number of samples collected.

RESULTS

A total of 320 samples of sludge were collected from eight refuse dump stands in Calabar South. Table 1 showed a total of 495 parasite eggs, cysts and trophozoites isolated from the different dump stands, representing seven species of *Ascaris lumbricoides, Enterobius vermicularis, Trichuris trichiura*, Hookworms, *Entamoeba histolytica, Balantidium coli* and *Schistosoma mansoni*. A total of 302 eggs, 131 cysts and 62 trophozoites were recovered from the study area.

Table 2 revealed prevalence of parasite infestation in relation to the selected 8 refuse dump stands. Infestation prevalence rate in each refuse dump stand recorded in descending order showed that Watt Market had 25.0%, Mount Zion 15.96%, New Airport Road 13.54%, Yellow Duke 12.32%, Ekpo-Abasi 9.90%, Mayne Avenue and Musaha 8.10% and Goldie Markdet 6.87%. In the overall prevalence rate of parasites across the dump stands *Entamoeba histolytica* presented the highest infection (64.7%), followed by *Ascaris luumbricoides* (44.1%), then by *Enterobius vermicularis* (22.5%), next by *Balantidium coli* (19.4%). *Trichuris trichiura and Hookworm* species presented a prevalence rate of 7.5%. The least prevalence rate of 2.5% was presented by *Schistosoma mansoni.*

Table 3 showed geometric intensities of parasitic forms in relation to refuse dump stands. The geometric mean intensities of infestation recorded in descending order are Watt Market 0.053, Mount Zion 0.048, New Airport Road 0.046, Yellow Duke 0.045 and Ekpo-Abasi 0.042. The geometric mean intensity of parasites recorded at Mayne Avenue and Musaha refuse dump stands was 0.040 each. The least geometric mean intensity of parasites (0.039) was recorded at Goldie Market refuse dump stand.

Table 4 showed the comparison of parasitic prevalence rates in refuse dump stands at markets and residential areas. The overall prevalence rate for refuse dump stands in the market areas was 99.4%, while that of residential areas was 94.7%. There was no statistical significant difference ($p>0.05$) in prevalence rate of parasites between refuse dump stands in the markets and residential areas. The highest rate encountered in the market areas was *Ascaris lumbricoides* (36.6%), and in residential areas was *Entamoeba histolytica* (34.41%). There was statistical significant difference ($p<0.05$) in parasitic infestation between these two areas. There were more eggs and cysts (287) parasitic infestation on residential refuse dump stands than (146) in market areas, while more (34) parasitic trophozoites were recovered from residential dump stands compared with 28 from market areas.

Table 1. Parasites isolated in the study area in relation to their forms.

Parasites	Parasitic forms recovered			Total
	Eggs	Cysts	Trophozoites	
Ascaris lumbricoides	53	88	-	141 (28.48)
Enterobius vermicularis	73	-	-	73 (14.75)
Trichuris trichiura	26	-	-	26 (5.25)
Hookworms species	22	-	-	22 (4.44)
Entamoeba histolytica	120	43	-	163 (32.93)
Balantidium coli	-	-	62	62 (12.53)
Schistosoma mansoni	8	-	-	8 (1.62)
Total	302 (61.01)	131 (26.46)	62 (12.53)	495 (100)

Numbers in parenthesis = percentages.

Table 2. Prevalence of infestation in relation to the refuse dump stands in Calabar South.

Location	No. of samples	*Ascaris lumbricoides*	*Entamoeba histolytica*	*Enterobius vermicularis*	*Hookworm species*	*T. trichiura*	*B. coli*	*S. mansoni*	Total
Ekpo-Abasi	40	13 (32.5)	20 (50.0)	6 (15.5)	0 (00.0)	2 (5.0)	7 (17.5)	1 (2.5)	49 (9.90)
Yellow Duke	40	19 (47,5)	19 (47.5)	10 (25.0)	0 (00.0)	0 (00.0)	13 (32.5)	0 (00.0)	61 (12.32)
Mayne Avenue	40	12 (30.0)	16 (40.0)	0 (00.0)	3 (7.5)	5 (12.5)	4 (10.0)	0 (00.0)	40 (8.40)
Mount Zion	40	22 (55.0)	30 (75.0)	12 (30.0)	0 (00.0)	2 (5.0)	5 (12.5)	2 (5.0)	79 (15.96)
Watt market	40	36 (90.0)	46 (115.0)	4 (10.0)	5 (12.5)	12 (30.0)	19 (47.5)	3 (7.5)	125 (25.0)
New Airport Road	40	17 (42.5)	13 (32.5)	25 (62.5)	6 (15.0)	0 (00.0)	5 (12.5)	1 (2.5)	67 (13.54)
Goldie market	40	11 (27.5)	11 (27.5)	7 (17.5)	0 (00.0)	2 (5.0)	2 (5.0)	1 (2.5)	34 (6.87)
Musaha	40	11 (27.5)	8 (20.0)	9 (25.5)	4 (10.0)	1 (2.5)	7 (17.5)	0 (00.0)	40 (8.10)
Total	320	141 (44.1)	163 (64.7)	73 (22.5)	24 (7.5)	24 (7.5)	62 (19.4)	8 (2.5)	495 (100)

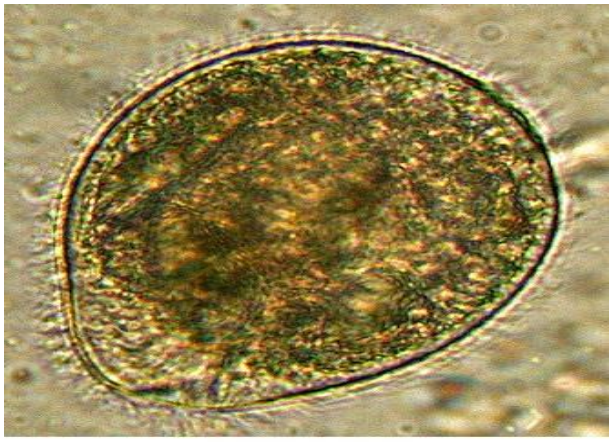
Numbers in parenthesis = Percentage.

Table 3. Geometric mean intensities of parasites collected from the selected refuse dump stands in Calabar South.

Location of refuse dump stand	No. of samples	Types of parasites collected			Total	GMI (log (x+1)/n)
		Eggs	Cysts	Trophozoites		
Ekpo-Abasi	40	30	19	-	49	0.042
Yellow Duke	40	50	11	-	61	0.045
Mayne Avenue	40	31	9	-	40	0.040
Mount Zion	40	45	34	-	79	0.048
Watt Market	40	59	29	37	125	0.053
New Air port Road	40	52	15	-	67	0.046
Goldie Market	40	5	4	25	34	0.039
Musaha	40	30	10	-	40	0.040
Total	320	302	131	62	495	0.353

Table 4. Comparison of parasitic infection rates of refuse dump stands in market and residential areas.

Parasite	Market refuse dump stands			Total	Residential refuse dump stands			Total
	Eggs	Cysts	Trophozoites	(N=175)	Eggs	Cysts	Trophozoites	(N=340)
Ascaris lumbricoides	23	41	-	64 (36.6)	30	47	-	77 (22.65)
Entamoeba histolytica	33	13	-	46 (26.3)	87	30	-	117 (34.41)
Enterobius vermicularis	10	-	-	10 (5.7)	63	-	-	63 (18.53)
Hookworms	6	-	-	06 (3.4)	18	-	-	18 (18.5)
Trichuris trichiura	12	-	-	12 (6.9)	12	-	-	12 (3. 53)
Balantidium coli	-	-	28	28 (15.4)	-	-	34	34 (10.00)
Schistisoma mansoni	8	-	-	8 (4.6)	-	-	-	0 (0.00)
Total	92	54	28	174 (99.4)	210	77	34	321 (94.41)



Balantidium coli trophozoite (mg x40).

Ascaris lumbricoides cysts (mg x40).

Trichuris trichiura eggs (mg x40).

Figure 1. Pictorial representation of some parasites recovered from selected refuse dump stands on the streets of Calabar South.

DISCUSSION

Lack of adequate personal hygiene, poor handling and ineffective management of refuse dumps, have been implicated in the transmission of many infectious diseases including ascariasis, schistosomiasis, cholera and typhoid (WHO, 2000).

This study revealed a high degree of refuse contamination with pathogenic eggs, cysts and trophozoites in Calabar South. This finding was in line with similar studies in Nigeria (Okoronkwo and Onwuliri, 1997) and in other parts of the world (Dube, 2011). The commonly found intestinal parasitic eggs, cysts and trophozoites from the sample areas include *Entamoeba histolytica*, *Ascaris lumbricoides*, *Enterobius vermicularis*, *Balantidium coli* and Hookworm species, while the least was *Schistosoma mansoni*. These eggs and cysts recovered from the sample area were essentially those that are shed in the faeces of humans and animals which became dispersed indiscriminately to refuse dumps. Another source includes litters from piggeries. It was reported by (Burges, 1982) that intestinal parasites of veterinary importance are capable of being transmitted to the public through abattoir waste which was indiscriminately deposited in the refuse dump.

The attitude of residents in the sampled area towards waste disposal depicts ignorance of the various dangers associated with indiscriminate and improper refuse disposal, as they consistently ignored use of designated facilities for refuse dumping, but rather choose to litter the environment.

Calabar South is highly inhabited and more thickly populated and therefore higher human activities. The presence of pathogenic parasites in this environment highlighted their risk of human infection and capability of causing outbreak of water or food borne amoebiasis, balantidiasis, ascariasis and enterobiasis. *Entamoeba histolytica i*s an enteric dwelling human protozoan parasite that causes the disease Amoebiasis, and is ranked as second only to malaria in mortality due to parasitic infection. It causes more than 100,000 deaths and is responsible for 50 million cases of diarrhoea each year, while *Enterobius vermicularis* causes the disease Enterobiasis (WHO, 2007).

Refuse dumps dot the landscape in many cities of Nigeria and lapses in Government policies have been implicated in the high prevalence rate of some parasitic infections in the various communities of Nigeria (Eneanya and Anikwe, 2005). In the surveyed area, refuse dumps are un-disposed for weeks and even months due non-payment of refuse evacuation contractors or breakdown of evacuating vehicles. In this study, the prevalence of parasitic infestation in the selected 8 refuse dump stands showed that in the overall, *Entamoeba histolytica*

presented the highest prevalence of infestation (64.7%). This high recovered protozoans from refuse dump stands on the streets of Calabar South, suggest their role as agents of Amoebic dysentery (Iboh *et al.,* 2014). This study has established high prevalence rate of intestinal parasites in the refuse dump stands, and could be a major risk factor of parasitic diseases on residents of this area. The geometric progression of parasitic contamination in refuse dumps indicated that Watt market had the highest mean intensity of infection. This study revealed that Balantidium coli trophozoites were collected mostly from market dump stands. This widespread contamination of the environment with pathogenic organisms underscores the importance of proper disposal of waste for the protection and promotion of sustainable health.

The provision of adequate sanitary facilities in Calabar South will interrupt the transmission of faecal-oral pathogens. It could be suggested that improvement on sanitation and community hygiene will have considerable impact in reducing communicable diseases in the study area. This observation is in line with (Feachman *et al.,* 2002) who reported 20% reduction in prevalence and intensity of intestinal parasitic infection through sanitation and improvement of personal hygiene. Parasitic disease intervention through mass chemotherapy and interactive health education has already commenced in some privileged communities in Nigeria (Etim *et al.,* 2002; Ogbe *et al.,* 2002).

CONCLUSIONS

In view of the high prevalence of intestinal parasitic infections of street un-disposed refuse dumps, there is urgent need for adequate provision and improvement of sanitary facilities and adherence to personal hygiene ethics, through health education in the study area. This will go a long way to reducing the scourge of intestinal parasites, and nuisance posed by the indiscriminate street refuse dumps.

Un-disposed refuge dumps left for long period of time gave room for the visit of birds, and rodent's domestic animals like cats, dogs, rabbits, etc. to such dump sites. In the course of scavenging on the refuge, they acquired most of the pathogens isolated and act as a source of zoonotic transmission to human and his habitation. Refuse dumps should be disposed regularly to avoid the risk of possible spread of the pathogens to the environment by these vectors.

Proper Health Education should be given to the inhabitants of Calabar South LGA to avoid disposing faecal materials into refuge dumps. This would reduce the occurrence of intestinal parasites in samples obtained from the refuge dumps. Faecal materials should be disposed in the appropriate sewage disposal septic tank system.

ACKNOWLEDGEMENT

Authors sincerely acknowledge the cooperation of members of Cross River Ministry of environment and refuse evacuation contractors, who contributed immensely to this investigation. Authors are also pleased to thank Mr. Ijang J.B. who made the pictorial representation of parasites recovered possible.

REFERENCES

Adewole, S.O. and Ajayi, A.A., 2010. Studies on Human Intestinal Parasites in Refuse Dumps. *J. Life Sci.,* 4 (1): 55-59.

Adeyeba, O.A. and Akinbo, J.A., 2002. Pathogenic intestinal parasites and bacterial agents in solid wastes. *East Afr. Med. J.,* 79 (11): 600-603.

Akinwale, A., 2005. Waste Management in Nigeria Local Government. International Conference on Energy, Environmental and Disaster. INCEED Charlotter, NC USA.

Bartone, C.R., 2000. Strategies for improving municipal solid waste management: Lessons from World Bank lending. Presentation at International workshop for planning of sustainable and integrated solid waste management. Manila, p. 18-22.

Bassavanthappa, B.T., 2008. Community Health Nursing. (2nd ed.). New Delhi. Jaypee Brothers Medical Publishers.

Burges, H.J., 1982. Large scale management systems and parasite populations: Prevalence and resistance of parasitic agents in animal effluents and their potential hygiene hazards. *Vet. Parasitol.,* 11: 49-69.

Dube, J.F., 2011. Toxoplasma, Hammondia, Besnoita, Sarcoystis and other tissue cysts forming coccidian of man and animals. Educational Parasitic Protozoa. New York Academy Press, p. 101-227.

Duncan, J.K.W., 1985. Sewage and Refuse Disposal Systems in Africa. University Press Ltd., Ibadan, Nigeria, p. 105-116.

Eneanya, C.I. and Anikwe, C., 2005. A school based intestinal helminthiasis and protozoan infectious programmes in Nigeria, *Niger. J. Parasitol.,* 26: 55-60.

Etim, S.E. Akpan. P.A. Abeshi, S.E. Enyi-Idoh, K., 2002. Intestinal helminthes control using school based mass chemotherapy. *Niger. J. Parasitol.,* 23: 53-60.

Feachem, R.G. Bradley, D.J. Garelick, H. Mara, D.D., 2002. Sanitation and disease, health aspects of excreta and wastewater management. World Bank Studies in water supply and sanitation. 3 Wiley Chichester, UK.

Gunduri, M.A. and Okwuosa, V.N., 2006. Prevalence of urinal and intestinal parasites in Kwampe district, Nigeria. *Nigeria J. Parasitol.,* 26: 19-22.

Iboh, C.I. Etim, L.B. Abraham, J.T. Ajang, R.O. 2014. Bacteria and parasites infestation of Cockroaches in a developing community, South Eastern, Nigeria. *Int.J. Bacteriol. Res.,* 2(5): 45-46.

Modebe, I. Onyeonoro, U.U. Ezeama, N. Ogbuagu, C.N. Agam, N.E., 2011 Public Health Implication of Household solid waste management in Awka South East Nigeria. *Int. J. Public Health*, 1 (1) Doi: 10.5580/265d.

Ogbe, M.G. Edet, E.E. Isichei, M.N., 2002. Intestinal helminthes infection in primary school children in areas of operation of Shell Petroleum Development Company in Delta State. *Nigeria J. Parasitol.,* 23: 3-10.

Okoronkwo, M.O. and Onwuliri, C.O.E., 1997. Some Health Hazards associated with solid waste management, Jos City, Nigeria. *J. Med. Lab. Sci.,* 6: 36-39.

Onyido, A.E. Okolo, P.O. Obiukwu, M.O. Amadi, E.S., 2009. A survey of vectors of public health diseases in un-disposed refuse dumps in Awka Town, Anambra State, Southeastern Nigeria**.** *Res. J. Parasitol.,* 4: 22-27.

Park, K., 2007. Park's Textbook of Peventive Medicine. (19th ed.). Jabalpur, Prem Nagar.

Sule, R.O., 2004. The environmental consequences of rapid urbanization in countries of the developing world, Calabar. Thumbprint International Company, Calabar, Nigeria.

World Health Organization, 2000. Global water supply and sanitation assessment. WHO, Geneva.

World Health Organization, 2007. Enterobiasis. International Statistical Classification of Diseases and related Health Problems (ICD). 10th Rivision, WHO.