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Parasitological Investigation of Dump Sites in Obio/Akpor Local Government Area of Rivers State, Nigeria

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ABSTRACT

Waste management is an important sanitary and public health problem in Nigeria which seems to defy solution. Refuse dump sites are ideal breeding places for various parasitic agents that could impact on the environment and quality of life. This survey was aimed at investigating the parasitic agents associated with the refuse dumps sites of Obio/Akpor local government area, Rivers State, South-south, Nigeria. A total of 420 samples of refuse sludge were collected from the study area and were examined using Baerman funnel method. From the results, 301 (71.7%) samples were positive for parasites. The rate of single parasite infestation was 268 (100%) while mixed or multiple parasite infestation was 33(78.5%). Rumuokrushi (oil mill area) recorded the highest prevalence of 58(21.64%) while Choba had the least prevalence of the parasites recovered 12(4.49%). There was a statistically significant association between the prevalence rate of the parasites in relation to location of the refuse dumps (X^2 = 16.9, df = 9, P < 0.05). The parasites species identified in Obio/Akpor include *Ascaris lumbricoides* as the most common parasite encountered 95(35.45%) followed by *Entamoeba histolytica* 75(27.99%), while *Strongyloides stercoralis* recorded the least prevalence 21(7.83%). There was a significant difference in the rate of occurrence of the parasites identified (X^2 = 9.49, df = 4, P < 0.05). The presence of these parasites in refuse dumps constitute a potential hazard to individuals since these parasites become dispersed in the environment through flies, poor personal hygiene setting of unwashed fruits and vegetables and inefficient environmental sanitation. Regular evacuation of waste materials and a well planned waste management for residents within the site is crucial to break the transmission cycle of these parasites forstall the spread of pathogenic organisms.

Keywords: Parasitological survey, refuse dumpsites, leachate, *Entamoeba histolytica*, *Ascaris lumbricoides*.

Introduction

The environmental public health has become a prominent, but complex and multi-dimensional issue on the public policy agenda of States and International Organizations. The issue of the environment after a long period of total neglect began in Rio in 1992. Average daily waste (refuse) generated in Obio/Akpor ranged between 900 to 1350 metric tons (Ogundele *et al.*, 2018). The agency charged with the role of solid waste management in Obio/Akpor was formerly Rivers State Environmental Sanitation Authority (RSESA) now Rivers State Waste Management Agency. The agency established refuse collection centers/points within the metropolis and evacuate refuse to approved government dumpsites.

Composition of waste generated include: garbage (41%), paper and plastics (35%), scrap metal and glass (15%), construction waste (4%), sludge (3%) and expired chemical wastes and drugs (2%) (*Ogundele et al*., 2018).

Inhabitants in the urban areas tend to dump refuse (waste) as if it has no effects on their community health and social welfare. In Obio/Akpor, population explosion has given rise to a heavily built up environment where houses are most closely built than before, which has resulted in the dumping of more refuse on the streets. Port Harcourt metropolis especially Obio/Akpor, the study area has continued to witness an increase in the disposal of household refuse

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carelessly on the road sides, drains, banks of the streams and in public places (Timiebi & Anthony, 2017). Inadequate management of wastes, besides having severe environmental health risk on human populations, is also capable of causing permanent damage on the ecological systems. Considering the magnitude of wastes released daily into the environment and, considering the fact that there appears to be no serious organized programme for the efficient management and disposal of these wastes, in spite of their environmental effects on human health, there is need for an understanding of the dynamics that are important for the explanation of the trends and emerging disease epidemics on the human environment, in order to ensure the evolution of effective government and public policies and programmes towards control (Okoli *et al*., 2020).

Furthermore, the health effects of improper waste disposal are enormous and cannot be ignored. There are reports that wastes that are not properly managed can cause water pollution which may breed diseases like cholera, typhoid (Ugoeze *et al*., 2021). Also, certain waste especially from chemicals if inhaled or touched can equally cause wide spread epidemics (Ugoeze *et al.*, 2021). All these are pointers to the fact that a proper understanding of the disposal and management of waste becomes imperative. Indiscriminate disposal of wastes is a threat to human health. Bernd *et al.* (2017) states that inadequate disposal of wastes is a major factor in the spread of gastrointestinal and parasitic diseases primarily caused by vectors. He further states that diarrhea, cholera and typhoid fever are among the major killer diseases due to improper disposal of wastes. Healthy people contribute greatly to the health and wealth of a nation. Among other factors, the environments in which people live affect their health. A healthy environment remains a source of well-being and it is the responsibility of individuals, households, communities, organizations, and the government to promote and improve healthy environment and healthy lifestyle. However, people can only promote healthy environment only if they are aware of its benefits.

The protection of human health and environment from the potential hazard arising from indiscriminate waste disposal and its consequential environmental pollution has been a crusade in human history. Obio/Akpor Local Government Area is the economic seat of Rivers State. The population explosion has contributed to the indiscriminate deposition of solid waste in the city.

It is heavily populated because of concentration of industries, government establishments, higher institutions and other commercial activities. This demographic factor joined with other social factors like level of illiteracy, flagrant breach of town planning law and lack of social facilities like public toilets, sewage facilities, potable water have led to indiscriminate dumping of solid wastes in the city. This assertion lends credence to the position of Fred Luthans as cited by (Agi, 1997) that deteriorating biological ecosystems will lead to a deprived "psychic environment". The implication of this is that if the ecosystems are poisoned by, for instance, deposition of solid waste or destroyed by the "population bomb", people will be deprived of decent and neat environment where they obtain oxygen, food and water and this could be detrimental to human race and existence (Ohaeri & Ibe, 2009).

Obio/Akpor as an urban centre lacks effective and efficient refuse/waste management system. Many major streets have turned to refuse dumping sites. The aim of the study was to investigate the parasitic agents of the refuse dumps in Obio/Akpo local government area of Rivers State, Nigeria.

Materials and Methods

Study Area

This study was conducted in Obio/Akpor Local Government Area of Rivers State, Nigeria. It is located between Latitudes $4^0$45'N and $4^0$60'N and longitude $6^0$50'E and $8^0$00'E. It is the largest Local Government Area in Rivers State covering about 260km^2 with its Headquarters in Rumuodomaya and a population of 464, 789 as at 2006 census (https://en.m.wikipedia. org). Identifiable seasons are the rainy season and dry season with an average atmospheric temperature of 25.50^{0}C and 30.0^{0}C during the rainy and dry season respectively. Daily humidity values range from 55.50% in dry season to 96.00% in rainy season while rainfall in the area averages 2500mm annually. The studied locations were Rumuokoro Road (4.8651'N,6.9880'E), Rumuodamaya -Airport Road (4.8805'N,6.9988'E) , NTA/ East/West (Nkpolu) Road (4.856'N,7.012'E), Choba (4.8917'N,6.9075'E), Alakahia (4.8851'N,6.9249'E), Aluu-Uniport (4.9339'N,6.9437'E), Rumuokrushi - Oil Mill Market

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(4.8500'N,7.0557'E), Rumuola - Bori Camp (4.8356'N,7.0256'E), Ozuoba (4.8657'N,6.9343'E) and Rumuosi/Rumuekini (4.8807'N,6.9404'E).

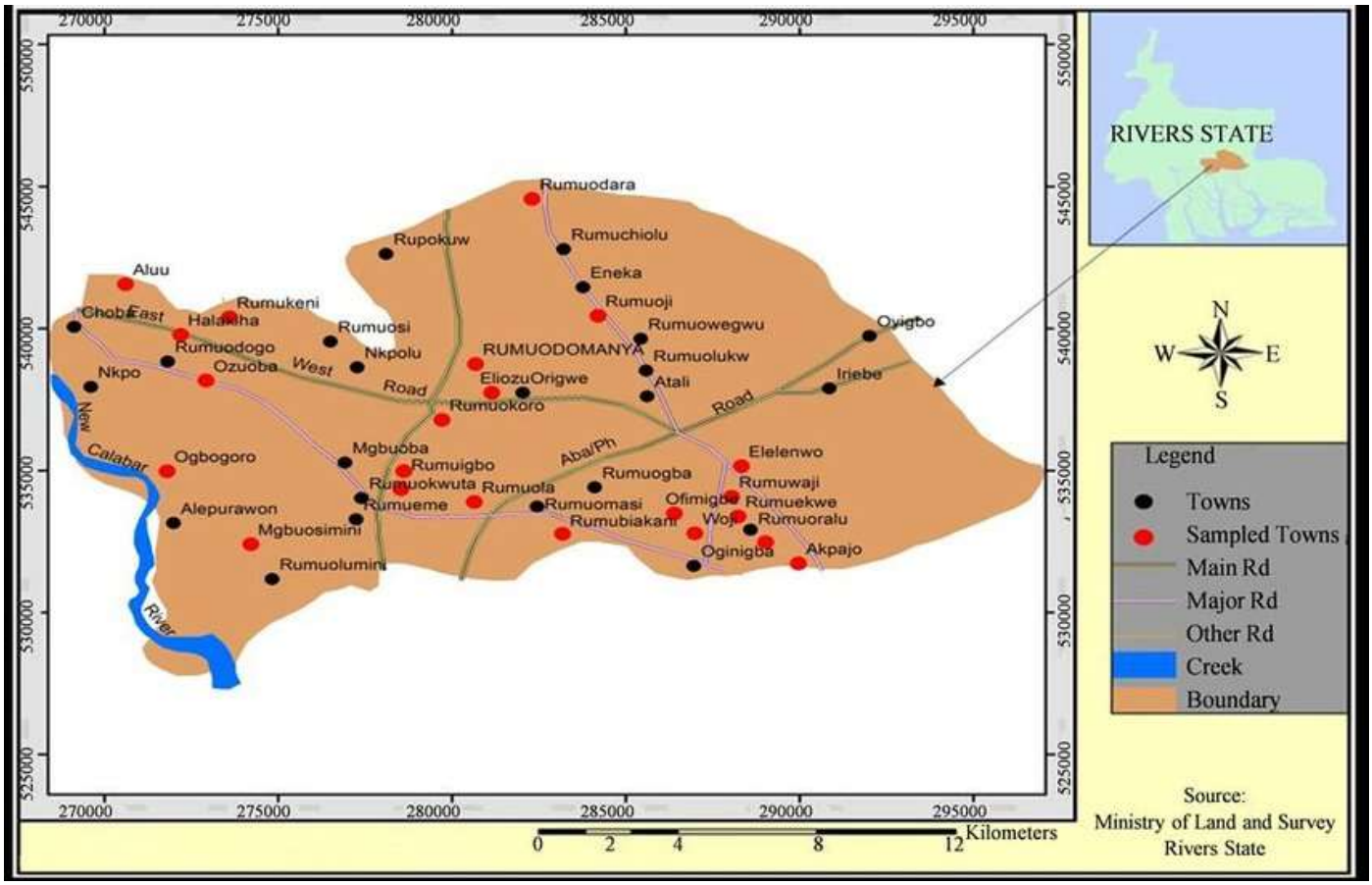

Figure 1: Map of Obio/Akpor Local Government Area Showing the Study Areas

Plate 1: Refuse Dump Site in Aluu-Uniport

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Sample Collection (Collection of refuse sludge samples)

Ten grams (10g) each of the refuse sludge was collected from ten (10) different locations with the aid of metal spatula into screw-capped sterile containers. The samples were collected between 6.30am and 8.00am to reduced odor, pest attraction and prevent disease spread. Baermann Funnel method and the method described by Adeyeaba and Akimbo (2002) were used to process the refuse sludge for parasites recovery. Forty two (42) samples of 10g sludge per location were collected from 10 locations resulting in a total of 420 samples).

Laboratory Analysis

Baermann's Funnel Method of Analysing Refuse Sludge (Encyclopedia, 2018).

A funnel was fit into a short piece of tubing to the stem, the tubing was closed with a clamp, the funnel was supported with a single stand. A double layer of cheesecloth was placed on a disposable paper towel on a bench. Using a spatula, 10g of the refuse sludge was placed in the centre of the cheesecloth pouch and a rubber band was used to close the cheesecloth pouch. A stick was pushed under the rubber band to suspend the pouch which contains the refuse sludge was placed on the funnel and filled with lukewarm water, it was allowed to stand for 24hrs, a few millilitres of the fluid was draw off the funnel stem into a test tube and was allowed to sediment for 30minutes, a Pasteur pipette was used to transfer two drops of the sediment fluid into a microscope slide and was examined under the microscope at X10 and X40 objectives.

Adeyeaba and Akimbo (2002) Method of Analysing Refuse Sludge

Ten grams (10g) of refuse sludge collected from the different dumpsites were air - dried and passed through a coarse sieve of 4mm^2 pore sizes to remove debris, grass, stone and other particles . The preparation was transferred into a volumetric flask. To each volume, 5mls of 30% sodium hypochloride was added to disinfect the sample. The sample was stirred and allowed to stand for 30 minutes. The mixture was then diluted with distilled water and stirred again. The coarse particles were strained by passing the sludge through a coarse mesh cloth into a centrifuge tube and centrifuged 3000rpm for 2 minutes.

The supernatant was discarded and the residue was re-suspended in magnesium sulphate flotation fluid of specific gravity, 3.1 and centrifuged again at 3000rpm for 2 minutes. The supernatant was discarded while the residue was placed on a microscope slide, covered with cover slip and viewed under low and high power objectives to detect worms, and eggs of parasites.

Data Analysis

Results obtained from the study were analyzed statistically using percentages while chi square was used to test the level of significance at 0.05.

Results

Prevalence of parasites recovered from Refuse Dumps in Obio/Akpor LGA of Rivers State

The prevalence of parasites in the refuse dumps studied is shown in Table 1. Out of 420 samples examined, an overall prevalence of 301(71.7%) was observed in the study area with Rumuokrushi (oil mill area) recording the highest prevalence 39(92.9%) and Choba with the least prevalence 22(52.4%). Statistically, there was a significant association between the prevalence rate of the parasites in relation to location (X^2 = 16.9, df = 9, P < 0.05).

Distribution rate of parasites recovered from the study sites

Overall rate of single parasite infestation was 268 (63.80%) while mixed or multiple parasite infestation was 33(78.5%). The parasites species identified in Obio/Akpor is shown in Table 2 and Table 3 with *Ascaris lumbricoides* as the most common parasite encountered 95(22.61%) followed by *Entamoeba histolytica* 75(17.85%), while *Strongyloides stercoralis* recorded the least prevalence 21(5%).

There was a significant difference in the rate of occurrence of the parasites identified (X^2 = 9.49, df = 4, P < 0.05). Mixed or multiple parasite infestation recovered from the refuse dumps include *Ascaris lumbricoides* and Hookworm having the highest occurrence rate 10(2.38%) followed by *Entamoeba histolytica* and *Ascaris lumbricoides* 7(1.66%) while *Ascaris lumbricoides* and *Trichuris trichiura* 1(1.66%) recorded the least rate.

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. **Table 1: Parasite prevalence in refuse dumps sites in Obio/Akpor LGA of Rivers State, Nigeria**

Location	No. of samples examined	No. of positive samples	% of positive samples
Rumuokoro	42	35	83.33
Rumuodomaya (Airport)	42	37	88.1
NTA/Nkpolu (East/West Road)	42	33	78.57
Choba	42	22	52.38
Alakahia	42	25	59.52
Aluu-Uniport	42	29	69.04
Rumuokrushi (Oil Mill)	42	39	92.86
Rumuola (Bori Camp)	42	31	73.81
Ozuoba	42	27	64.28
Rumuosi/Rumuekini	42	23	54.76
Total	**420**	**301**	**71.7**

($\mathbf{X}^2$ = 16.9, df = 9, P < 0.05).

Table 2: Rate of single parasites recovered from the study sites

Location	Parasite					Total (%)
	Hookworm	*Trichuris trichuria*	*Ascaris lumbricoides*	*Entamoeba histolytica*	*Strongyloides stercoralis*	
Rumuokoro	6	8	10	8	4	36 (13.43)
Rumuodomaya	4	5	15	13	6	43 (16.04)
Nkpolu/Rumuigbo	3	2	13	11	0	29 (10.82)
Choba	4	3	3	2	0	12 (4.49)
Alakahia	2	2	9	7	0	20 (7.46)
Aluu Uniport	3	1	6	4	0	14 (5.22)
Rumuokrushi (Oil Mill)	9	6	19	16	8	58 (21.64)
Rumuola (Bori Camp)	5	3	8	6	2	24 (8.96)
Ozuoba	3	2	7	5	0	17 (6.34)
Rumuosi/Rumuekini	2	4	5	3	1	15 (5.60)
Total (%)	**41 (15.30)**	**36 (13.43)**	**95 (35.45)**	**75 (27.99)**	**21 (7.83)**	**268 (100%)**

($\times^2$ = 9.49, df = 4, P < 0.05)

Table 3: Rate of multiple parasites found in refuse dumps sites in Obio/Akpor

Parasites Species	Numbers of Mixed Infections	% positive
A. lumbriciodes/Hookworm	10	2.38
Hookworm */T. trichuria*	3	0.71
A. lumbricoides/Trichuristrichuria	6	1.42
E. histolytica/A. lumbricoides	7	1.66
A. lumbriciodes/ S. stercoralis	2	0.47
Hookworm */E. histolytica/A. lumbricoides*	4	0.95
A. lumbriciodes/T. trichuria/S. stercoralis	1	0.23
Sub-Total	**33**	**7.85**
Total Parasites identified in Refuse Dumps	**301**	**71.7**

(X^2 = 9.49, *df* = 4, *P*< 0.05)

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Discussion

Intestinal parasites have been one of the major causes of illness to man in both urban and rural settlements (Brown & Idaminabo, 2020). This study has revealed the prevalence of intestinal parasites identified in various refuse dumps in Obio/Akpor Local Government Area of Rivers State, Nigeria.

This study showed high prevalence of human intestinal parasites in refuse dumps in Obio/Akpor (71.67%) with Rumuokrushi (92.86%) recorded the highest prevalence and Choba (52.38%) had the least prevalence (Aroloye, 2019). The high prevalence recorded in Rumuokrushi was attributed to the unhygienic practices going on in oil mill market and its environs. This finding correlates with the studies carried out in Sagbama, in Bayelsa State and Umuahia, Abia State (Eze & Mbah 2021). However, this was generally attributed to improper disposal of excreta practices, poor environmental sanitation and indiscriminate defaecation. The intestinal parasites encountered in these refuse dumps are Hookworm species, *Trichuris trichuria*, *Ascaris lumbricoides*, *Entamaeba histolytica* and *Strongyloides stercoralis*. This observation is in agreement with other reports in the study area (Nduka *et al*., 2006).

Ascaris lumbriocoides (56.33%) had the highest prevalence followed by *Entamoeba histolytica* (21.50%) while *Strongyloides stercoralis* (4.5%) was the least occurring parasite. This report is in line with the findings of (Idahosa, 2011) in Umuahia, Abia State, (Nduka *et al.,* 2006) in Ishiagu, Abia State and (Ohaeri & Ibe, 2009) in Aba, Abia State. The pattern of mixed intestinal parasitic infestation showed that *Ascaris lumbricoides* and Hookworm species had the highest rate. This observation is comparable to other findings in Nigeria. The high number of positive cases recorded could be due to the fact that *Ascaris lumbricoides* is able to withstand harsh environmental condition and desiccation enabling it to remain in an environment for a longer period. *Entamoeba histolytica* spread more in contaminated environment and unhygienic practices, hookworm transmission is highly seasonal to change (Le-Barl & Itoro, 2020).

According to (Chijioke *et al*., 2018) governments need ways to measure whether they are pressing towards sustainable development and how their progress compares to that of their neighbours.

The result of this study confirms the report of (Agi, 1995) that the present mass environmental education programmes on radio and television are not always directional, they hardly educate ordinary citizens whose behaviours and skills mostly degrade the environment. (Okunola *et al.,* 2019) affirms that the social media should educate people on health related issues in their columns, future articles, health sports and panel discussion. The findings revealed that the effects of refuse on the inhabitants of Obio/Akpor constitute major public health problem, since the practice of refuse disposal on the dumpsites is apparently unhygienic and harzardous. The presence of these parasitic contaminants in the environment as a result of unhygienic and indiscriminate disposal of waste presents enormous effects (Zemichael *et al.,* 2017). The high prevalence of intestinal parasites revealed in the study area posed health risk to the general public, it becomes important to formulate preventive and control measures(Olusegun *et al.,* 2018).

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