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PATHOGENIC INTESTINAL PARASITES AND BACTERIAL AGENTS IN SOLID WASTES

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ABSTRACT

Objective: **To determine the profile of potentially pathogenic enteric parasites and bacterial agents in municipal refuse dumps in Ibadan, Nigeria.**
Design: **A cross-sectional survey.**
Setting: **Five major market places refuse dumps in Ibadan municipality, Nigeria.**
Methods: **The major market places in Ibadan city were randomly selected by lottery method. The refuse sludge were sampled and examined parasitologically and bacteriologically using the methods as described. Data analysis was done by using chi-square test where applicable.**
Results: **Cases of multiple intestinal parasites and bacterial agents were commonly encountered in the sludge refuse samples. The commonly found parasitic agents were of both human and veterinary importance. These include *Ascaris Lumbricoides* (9.3 egp), *Entamoeba histolytica* (8.07 cyst per gram), Hookworm/strongyle (6.27 egp) and *Ascaris suum* (1.07 egp). Others were *Ascaris vitolorum* (1.09epg), *Strongyloides papillosu* (0.52 larvae per gram.), *Schistosoma suis* (0.31 epg) *Dicrocoelium dendriticum*(0.9egp). The most commonly found bacterial agents were *Klebsiella species, Escherichia Coli, Proteus species, streptococci,* and other gram-positive organisms. Climatic conditions affected the distribution of both parasites and bacterial agents in the sludge ($P<0.001$). More intestinal parasites 2423 (53.4%) and bacterial agents 2150 (27.2%) were encountered at mean air temperature 26.1±0.6, mean relative humidity of 72±3.5%. The degree of contamination by market locations varies significantly ($P<0.001$).**
Conclusion: **A high degree of contamination of solid waste dumpsites with bacterial and parasitic agents was observed in the present study. As a result of the public health importance of the organisms isolated it is opined that well planned waste management and health education programs will go a long way to reduce the potential epidemic risks posed by such sites in Ibadan, Nigeria.**

INTRODUCTION

Refuse, soil, animal waste and sewage sludge are common sources of manure, used to fertilize agriculture fields(1-3). Studies have revealed the incidence and distribution of many pathogenic intestinal parasites and bacterial agents from refuse which infect both man and animals(4-6). The most commonly found bacterial agents include gram negative enteric bacteria like *Pseudomonas species, Salmonella species, Klebsiella species, Escherichia coli, Aeromonas* species and some gram-positive organisms(4-8).

Similarly intestinal parasites are life threatening in many communities and are of a major international health concern(9). It has been shown that refuse dumps are significant source of transmission for intestinal parasitic infection in Kampala, Uganda and Jos, Nigeria(10,11). Whereas many workers have isolated veterinary and medically important parasitic agents from refuse dumps and abattoir in some parts of the world(11-13), there is dearth of information on the status of refuse dumps in Southwestern Nigeria, especially Ibadan, where refuse dumps are found everywhere. Hence this study is designed to determine the profile of potentially pathogenic enteric bacterial and parasitic agents in refuse dumps in major markets in Ibadan metropolis.

MATERIALS AND METHODS

Study Area: This study was carried out between July 1999 and January 2000 in Ibadan, capital of Oyo State, Nigeria, the most populous black city south of Sahara with about 3.5 million (1991 national census). Being a metropolitan city, there is influx of people of other nationalities beside the local indigenous for many reasons socioeconomic and political. This deluge of people into the city has given rise to many market places in the city to the extent that many mountainous refuse dumps are common features in the market

places because of the inabilities of the responsible authority to cope with the disposal. It is a common site to find these refuse dumps disturbing both vehicular and pedestrian movements in the city.

Ibadan experiences both wet and dry seasons. April and October span the rainy season (with average rainfall of about 550mm and 1000mm), while the dry season covers the period of November and March (Federal Office of Statistics, Lagos, 1998).

Sample Selection: For the purpose of this study, five major market places were randomly selected (by lottery method) from the list of markets in the metropolis.

Sample Collection: A total of 1610-refuse sludge was collected in all the refuse dumps in the study areas. Each of the five refuse locations was visited 14 times and the collections were done twice in the day between 7.00hr – 8.00hr (mean relative humidity of 82±3.0% mean air temperature of 26.1±0.6°C) and 15.00hr-17.00hr (mean relative humidity of 72±3.5%, mean air temperature of 28.4±0.5°C) respectively. On each of the first and second visit, 23 samples were taken to make up 322 samples taken from each refuse location at the end of seven months period of the study.

Sample of about 100g was collected with the aid of sterile wooden spatula into sterile 20 cc screw - capped plastic bottle. The samples taken from the depth of 10cm at different points of each refuse site in order to ensure adequate coverage and equal representation. These were later pulled together to produce a single sample for analysis per dumpsite.

Sample Analysis:

Parasitology: This was carried out by using the technique described by Kegie(14). 100g refuse sludge as weighed was passed through a coarse sieve of 4mm^2 pore size to remove stones, grass and other undesirables. The preparation was later transferred quantitatively to 50ml volumetric flask. To each volume of refuse, 2 volumes of 30% sodium hypochlorite fluid were added as disinfectant, vigorously stirred and allowed to stand for 30 minutes. This mixture was further diluted to the 50ml mark and mixed again. Coarse particles were strained out by passing through a coarse mesh cloth into a centrifuge tube and centrifuged at 3000 rpm for two minutes. The supernatant was discarded and the deposit re-suspended in magnesium sulphate floatation fluid of specific gravity 1.3, and then centrifuged again at 3000 rpm for another two minutes.

The floatation fluid in the centrifuge tube was then filled up to form a positive meniscus and a coverslip was superimposed on it and left to stand for five minutes. The covership was then lifted with a swift action and placed on a glass and examined microscopically for the presence of cyst and eggs of parasite as described by Lelano, *et al*(13).

Bacteriology: 100g refuse sludge was passed through a coarse sieve of 4mm^2 pore size to remove stones, etc. This was homogenized in 50ml volumetric flask with sterile normal saline. Sample was seeded on blood agar, MacConkey agar and Deoxycholate citrate agar plates and selenite F broth for the primary isolation of organism as described by Cruickshank *et al*(15). All cultures were incubated at 37°C overnight in the presence of free oxygen. All isolates were characterized and identified by using the criteria of Cowan and Steel(16). Oxford Staphylococcus (NCTC 6571) and *Escherichia, coli* (NCTC 10418) were used as control.

Data Analysis: The data analysis was done by using the chi-square test to test significance where applicable.

RESULTS

Parasites encountered in refuse dumps in Ibadan. Table 1 shows the profile of the intestinal parasites isolated from refuse waste dumps in Ibadan metropolis with corresponding probable hosts. These parasites include protozoan cysts. Oocyst and helminthes eggs of man, dog, sheep pig, cattle and goat of the 18 different species recovered., protozoa cysts were five, helminthes eggs 12 and one flagellate. *Ascaris lumbricoides* (9.37 epg) is the most frequently encountered parasite, followed by *Entamoeba histolytica* (8.07 cysts) Hookworm/strongyle (6.27 epg) while *Schistosoma suis* (0.31 epg) was the least encountered.

Incidence of intestinal parasites in Ibadan municipal refuse dump by market locations is shown in Table 2. Results shows multiple parasitic agents in each refuse dump sample. The level of contamination with parasitic agents by refuse dump differs significantly (X^2=1391.52, df = 4, P<0.001). Of the total 4727 cases of polyparasitism by market locations, Sango with 1263 (26.7%) had the highest incidence rate of multiple parasitic contaminations. This was followed by Oritamerin market dumpsite 1245 (26.3%), Bodija, 1182 (25.0%), Oje, 599 (12.7%) and Dugbe, 438 (9.3%). Though Sango refuse dump appeared to be the most contaminated of all, this variation, compared to Oritamerin and Bodija refuse locations was statistically insignificant (P>.0.001).

Table 1

Parasitic ova, cysts and larvae found in refuse dumps in Ibadan

Ascaris vitulorum	Cattle	109 Parasites
Possible host	Total numbers of cyst/egg/100g	
Entamoeba histolytica	man	807
Entamoeba coli	man	204
Balantidium coli	man	34
Gardia lamblia	man, dog, cat	190
Trichomonas hominis	man	506
Coccidia (oocyst)	sheep	126
Ascaris lumbricoides	man, pig	937
Ascaris suum	man, pig, cattle	107
Hookwom	man	627
Trichuris trichiura	man	160
Trichuris ovis	sheep, goat	108
Strongyloides stercoralis	man	333
Trichostrongylus	sheep	66
Strongyloides papillosu	sheep	52
Fasciola hepatica	man, sheep, goat	202
Taenia specie	man, pig, cattle	81
Dicrocoelum dandriticum	sheep, goat	48
Schistosoma suis	pig	31

Table 2

Incidence of intestinal parasites from municipal refuse dumps in Ibadan by markets locations

		Percentage of positive cases																			
Refuse Locations	*No. of* Samples	*Entamoeba histolytica* (%)	*Entamoeba coli* (%)	*Balantidium coli* (%)	*Gardia lamblia* (%)	*Trichomonas huminis* (%)	*Cocoidia Oocyst* (%)	*Ascaris lumbricoides* (%)	*Ascaris Suum* (%)	*Ascaris vitulorum* (%)	*Hookworm* (%)	*Trichuris trichiura* (%)	*Trichuris ovis* (%)	*Strongyloidies stercoralis* (%)	*Tricho Strongyl* (%)	*Strongyloides papillosu* (%)	*Fasciola hepatica* (%)	*Taenia specie* (%)	*Diro coeli umdenditic um* (%)	*Shistosoma suis* (%)	Total with polyparastism per dump site	Degree of contamination #
Bodija	322	10.7	1.4	1.6	2.0	6.2	9.1	21.8	4.8	1.2	6.6	2.1	6.2	5.6	3.7	4.4	7.5	0	3.1	1.9	1189	25.0
Sango	322	26.9	7.1	1.2	3.9	11.2	1.3	17.0	0.7	0	16.8	1.9	2.2	9.4	0	0	0	0	0	0.7	1263	26.7
Oritamerin	322	10.1	5.8	0	4.3	14.41	0.5	18.4	3.3	4.3	14.3	3.1	0.6	7.1	1.8	0	8.5	3.2	0.9	0	1245	26.3
Dugbe	322	24.2	4.3	0	8.6	13.9	0	30.3	0	0	17.1	0	0	2.7	0	0	1.5	4.7	0	0	438	9.3
Oje	322	24.2	1.0	0	4.3	8.3	0	17.0	0	6.8	14.6	12.1	0	8.0	0	0	0	3.3	0	0	599	12.7

Table 3

Prevalence of intestinal parasites in Ibadan municipal refuse dumps at mean air temperature of 26.1 ± 0.6°c and mean relative humidity of 82 ± 3%

		Percentage of positive cases																			
Refuse Locations	*No. of* Samples	*Entamoeba histolytica* (%)	*Entamoeba coli* (%)	*Balantidium coli* (%)	*Gardia lamblia* (%)	*Trichomonas hominis* (%)	*Coccidia Oocyst* (%)	*Ascaris lumbricoides* (%)	*Ascaris Suum* (%)	*Ascaris vitulorum* (%)	*Hookworm* (%)	*Trichuris trichiura* (%)	*Trichuris ovis* (%)	*Strongyloidies stercoralis* (%)	*Tricho Strongyl* (%)	*Strongyloides papillasu* (%)	*Fasciola hepatica* (%)	*Taenia specie* (%)	*Diro coeli um dendritic um* (%)	*Shistosoma suis* (%)	Total Parasitism refuse sample	Degree of contamination per dump site
Bodija	161	7.4	1.6	1.4	3.3	4.7	8.7	22.6	3.6	0.7	8.2	1.0	7.6	2.4	5.0	6.4	8.2	0	4.7	2.3	576	22.8
Sango	161	38.6	3.0	2.2	5.0	12.8	0	13.1	0.4	0	20.8	0.9	1.4	1.1	0	0	0	0	0	0.6	696	27.6
Oritamerin	161	4.2	4.2	0	5.2	12.1	0	21.4	0	5.2	13.9	5.1	0	11.3	1.3	0	9.6	4.4	2.0	0	62	24.3
Dugbe	161	12.5	5.9	0	12.5	12.8	0.7	26.4	0	0	18.3	0	0	4.4	0	0	1.5	5.1	0	0	273	10.8
Oje	161	12.0	0.3	0	7.1	3.3	0	24.0	0	5.5	19.1	19.1	0	6.8	0	0	0	1.9	0	0	366	14.5

Table 4

Prevalence of intestinal parasites in Ibadan municipal refuse dumps at mean air temperature of 28.4 ± 0.5°c and mean relative humidity of 72±3.5%

		Percentage positivity																			
Refuse Locations	*No. of* Samples	*Entamoeba histolytica* (%)	*Entamoeba coli* (%)	*Balantidium coli* (%)	*Gardia lamblia* (%)	*Trichomonas huminis* (%)	*Cocci dia Oocyst* (%)	*Ascaris lumbricoides* (%)	*Ascaris Suum* (%)	*Ascaris vitulorum* (%)	*Hookworm* (%)	*Trichuris trichiura* (%)	*Trichuris ovis* (%)	*Strongyloid stercoralis* (%)	*Tricho Strongyl* (%)	*Strongyloides papillosu* (%)	*Fasciola hepatica* (%)	*Taenia specie* (%)	*Dicro coeli um dend riticum* (%)	*Shistosoma suis* (%)	Total parasitism	Degree of contamination
Bodija	161	13.5	1.3	1.8	0.8	7.8	9.4	21.1	5.9	1.2	5.3	3.1	4.1	8.6	2.5	2.5	6.5	0	1.5	1.5	606	27.5
Sango	161	12.5	12.2	0	2.5	9.3	2.8	21.9	0	0	10.9	3.2	3.2	11.9	0	0	0	0	0	0.9	567	25.7
Oritamerin	161	15.8	7.3	0	3.3	16.6	0	15.5	3.5	4.3	14.7	1.1	1.1	3.0	2.2	0	7.7	2.1	0	0	633	28.7
Dugbe	161	21.8	1.8	0	2.4	15.8	0	37.0	0	0	15.2	0	0	0	0	0	1.8	4.2	0	0	165	7.5
Oje	161	43.3	2.1	0	-	16.3	-	6.0	9.0	6.8	7.7	-	0	9.9	0	0	0	5.6	0	0	233	10.6

* Total depict polyparasitism in refuse sample

\# Percentage contamination per refuse dump

() Percentage contamination

Table 3 shows the prevalence of intestinal parasites encountered in Ibadan refuse dumps at mean air temperature 26.1±0.6 and mean relative humidity of 82±3.0%. Results show the profile of intestinal parasite encountered. Data revealed the degree of contaminations in each of the refuse locations. Of the total (2523) number of polyparasitism at this climatic condition, *A. lumbricoides* had the highest prevalence rate (20.2%) followed by *E. histolyica.* (16.5%), strongyle (15.7%) and *S. suis;* (0.6%). There was a statistical significant difference in the degree of contamination by refuse location (X^2=1781.04, df = 4, P<0.001).

Table 4 shows the occurrence rate of intestinal parasites encountered at mean air temperature of 28.4±0.5°C and mean relative humidity of 72±3.5%. Of the 2204 positive cases of polyparasitism, *A lumbricoides* (19.3%) had the highest occurrence rate, followed by *E. histolylica* (17.7%), Hookworm (strongyle) (10.4%) and *Dicrocelium dendriticum* (0.4%) respectively. The variations by refuse dump differ significantly (X^2= 98.61, df=4, P<0.001). However, the difference between Bodija (27.5%) and Oritamerin (28.7%) was not significant (P>0.001).

The incidence of the potentially pathogenic bacterial agents isolated from municipal dumps in Ibadan by market locations is shown in Table 5. The results shows a varying degree of multiple bacterial agents by each refuse location., Oritamerin, 945 (25.1%) was the most frequently contaminated, followed by Bodija, 882 (23.4%); Dugbe 75.5 (20.1 %)and Sango 579 (15.4%). These variations show a significant statistical difference (χ^2=2501.99. df = 4, P<0.001). However, the difference between Sango 579 (15.4%) and Oje 601 (15.9%) was not significant (P>0.001).

Table 6 shows the prevalence of potentially pathogenic enteric bacterial agents isolated at mean air temperature of 26.1 ±0.6°C and mean relative humidity of 82 + 3.0%. Of the 2150 multiple bacterial agents isolated at this climatic condition, *Klebsiella* specie 573 (26.7%) was the most prevalent followed by *E. coli* 473 (22.0%) while the least encountered was *Streptococcus species* 12 (0.6%). There was significant difference in the degree of contamination by market locations (χ^2 = 1173), df=4, P<0.001).

Table 5

Incidence of potentially pathogenic bacteria in municipal refuse dumps in Ibadan by market locations

Refuse Location	No. of samples examined	Percent positivity: *Staphylo-coccus aureus* (%)	*Staphylo-coccus albas* (%)	*Staphylo-coccus specie* (%)	*Yeast cells* (%)	*Gram positive bacilli* (%)	*Esche-richia coli* (%)	*Klebsiella specie* (%)	*Proteus specie* (%)	*Pseudo-monas specie* (%)	*Salmo-nella specie* (%)	Total *	Degree of contamination(%) #
Bodija	322	5.6	10.3	2.6	5.2	11.5	17.3	20.6	6.0	16.9	4.6	882	23.4
Sango	322	3.2	2.7	0.6	9.7	15.0	15.8	23.4	7.1	16.9	5.1	579	15.4
Oritamerin	322	7.1	3.8	0	3.8	9.3	19.4	25.2	10.4	19.7	1.2	945	25.1
Dugbe	322	8.2	6.1	0	3.8	14.8	20.7	16.1	11.1	9.9	9.0	755	20.1
Oje	322	6.4	4.2	0	1.9	19.4	20.9	18.6	11.8	15.8	0.6	601	15.9

* Total depict polyparasitism in refuse sample.
\# Percentage contamination per refuse dump.

Table 6

Prevalance of potentially pathogenic bacteria in refuse dumps in Ibadan at mean air Temperatures of 26.1±0.6°C Mean Relative Humidity of 82±3.0%

Refuse Location	No.of sample examined	Percent Positivity: *Staphylo coccus aureus* (%)	*Staphylo coccus albas* (%)	*Staphylo coccus specie* (%)	*Yeast cells* (%)	*Gram positive bacilli* (%)	*Esche richia coli* (%)	*Klebsiella specie* (%)	*Proteus specie* (%)	*Pseudo monas specie* (%)	*Salmo nella specie* (%)	Total *	Degree of contamination(%) #
Bodija	161	4.1	2.3	2.3	6.4	10.9	22.2	17.3	2.8	12.9	4.9	532	24.7
Sango	161	5.1	1.2	0	16.9	16.0	15.4	27.8	3.3	9.7	4.5	331	15.4
Oritamerin	161	4.8	1.3	0	2.6	7.9	1.7	31.8	10.3	18.6	1.1	544	25.3
Dugbe	161	5.4	1.0	0	6.2	16.7	25.1	23.8	17.2	3.8	0.8	390	18.1
Oje	161	5.9	2.5	0	0.8	21.5	24.9	19.8	15.3	8.5	0.6	353	16.4

*Total depict polyparasitism in refuse sample.
#Percentage contamination per refuse dump.

Table 7

Prevalance of potentially pathogenic bacteria in refuse dumps in Ibadan at mean air Tempereatures of 28.4 ±0.5°C Mean Relative Humidity of 72±3.5%

		Percent Positivity											
Refuse Location	No.of sample examined	*Staphylo-coccus aureus* (%)	*Staphylo coccus albas* (%)	*Staphylo coccus specie* (%)	*Yeast cells* (%)	*Gram positive bacilli* (%)	*Esche richia coli* (%)	*Klebsiella specie* (%)	*Proteus specie* (%)	*Pseudo monas specie* (%)	*Salmo nella specie* (%)	Total *	Degree of conta mination(%) #
Bodija	161	7.7	17.1	3.1	3.4	12.3	10	10.6	10.9	20.6	4.3	350	21.7
Sango	161	0.8	4.8	1.6	0	13.7	16.5	17.7	12.1	26.6	6.0	248	15.4
Oritamerin	161	11.2	11.5	0	5.5	11.2	16.2	16.4	10.5	21.4	1.2	401	24.8
Dugbe	161	11.2	11.5	0	1.4	12.7	16.2	7.9	4.7	16.4	17.8	365	22.6
Oje	161	7.3	6.5	0	3.6	16.5	15.3	16.9	6.9	17.8	0	365	22.6

* Total depict polyparasitism in refuse sample
\# Percentage contamination per refuse dump.

The results on the prevalence of potentially pathogenic bacterial agents isolated at mean air temperature of 28.4 ± 0.5°C and mean humidity of 72 ± 3.5% shows that of the 7612 cases of multiple bacterial contamination at this climatic condition, *E. coli* 238 (14.8%) was the highest prevalent followed by *Klebsiella specie* 218 (13.8%) and *Streptococcus* specie 15(0.9%). The variations in the contamination rate by refuse dump were also significant (X^2 = 834.23 df = 4, P<0.001).

DISCUSSION

This study has shown that there are high degrees of refuse contamination with pathogenic human and animal intestinal parasites and bacterial agents in Ibadan municipality. The commonly found intestinal parasites include *A. lumbricoides, E. histolytica,* hookworm (strongyle), while the least encountered was *Schistosoma suis*. The cysts, oocyst and helminthes eggs recovered from the refuse dump sample were essentially those that were shed in the faeces of human and animals which became dispersed indiscriminately to refuse dumps. Other potential sources include litters from poultry farms, piggeries, sheep, goat from market in the study area and waste from abattoir houses. These sources of cysts and eggs in refuse dumps are similar to those previously reported elsewhere in Nigeria(1,17), and in other parts of the world(18,19). The report of isolation of intestinal parasites of veterinary importance such as *A suum, A.vitulorum Strongyloides papillosu* in Ibadan refuse dumps accords well with the report of Burger(12) that intestinal parasites of veterinary importance are capable of been transmitted to the public through abattoir wastes which were indiscriminately deposited in the refuse dump.

The isolated parasitic agents from municipal refuse are capable of causing outbreak of water or food borne amoebiasis, giardiasis or balantidiasis through the contaminative route(11). This is in consonance with reports of outbreak of giardiasis from cyst and oocyst in municipal sludge(18,19). These reports corroborate the fact that other agents isolated in this study are potential sources of infection to the population in Ibadan.

This study has shown that there were cases of multiple parasitic contaminations in each refuse dump sample. The incidence of the parasites by market locations has shown a statistically significant difference (X^2 = 1391.52, df = 4, P<0.001). Though Sango refuse dump appeared the most contaminated, the degree of contaminations compared to Oritamerin and Bodija refuse locations is not significant (P>0.001). This meant that risk of contracting disease in these areas is relatively the same. The level of pollution in these market places is bound to be higher than the rest as residential buildings in the area have no toilet nor waste disposal facilities hence the residents often make use of the market as dumping ground for their excrement and other wastes.

It has been shown in this study that climatic condition has significant impact on the occurrence rate of parasitic agents in refuse dump in Ibadan. More intestinal parasites (53.4%) were isolated at mean air temperature of 26.1 ± 0.6°C mean relative humidity of 8.2 ± 3.0% than 46.6% isolated at mean air temperature 28.4 ± 0.5°C and mean relative humidity 72 ± 3.5%. This report accords well with other reports(20-22) that the survival of intestinal parasites is dependent on favourable degree of temperature, moisture, humidity, desiccation, and biological activities.

The potentially pathogenic bacterial agents recorded in this study are essentially gram negative enteric bacteria and few other gram positive. These organisms which were also reported earlier(5-7) include *Klebsiella species, Escherichia coli, Proteus species, Pseudomonas*

species, Salmonella species, Staphylococcus aureus and *Staphyloccocus albus* and yeast cells. According to Ashiru and Osoba(23), a number of human diseases have been attributed to have originated from community acquired bacterial agents, especially where environmental conditions such as poor sanitation, heavy flies density and indiscriminate disposal of human and animal waste is prevalent. It is important to note that the heap of refuse dumps in the study area is located near the market center where arrays of exposed food items are displayed. Earlier on, Adeyeba and Okpala(24) have reported that common filth houseflies are active mechanical transmitters of potentially pathogenic parasites and bacterial agents in Ibadan markets. The incidence of the potentially pathogenic bacterial agents in refuse dumps in Ibadan market further confirms the report of Adeyeba and Okpala(24) as enunciated. The results shows a varying degree of multiple bacterial contaminations. Though the variation was generally statistically significant (X^2= 251-50, df = 4, P<0.001) in the study area, the degree of bacterial contamination in Sango market (15.4%) and Oje market (15.9%) was not significantly different.

Prevalence of these multiple bacterial agents varies with change in climatic condition. It has been shown that at mean air temperature of 26.1±0.5°C and mean relative humidity of 82±30%, more bacterial agents were isolated in the refuse than at mean air temperature of 28.4 ± 0.5°C, mean relative humidity of 72 ± 3.5%. The difference in the prevalence by climatic condition was statistically significant (X^2= 834.23) df = 4, P<0.00.1). This reinforces the fact that the survival of bacterial agents depends on conducive atmospheric conditions among other factors as opined by Adeyeba and Okpala(24).

This study has shown that there are high degrees of refuse contamination with pathogenic intestinal parasites and bacterial agents in Ibadan market places. These reservoirs of potential infections agents portends a great danger to public health as most food stuff, sold in the markets are often left exposed to house flies which are mechanical carriers of pathogens in the area(24). It is our considered opinion that the waste dumps in Ibadan could be turned to useful economic resources as against the present status of "nursery of pathogens". Therefore the mountainous refuse dump could be processed into organic fertilizer for use by the farming community of the state and boost the economy of the area. The fertilizer plant would also provide job opportunity for the youth as part of the poverty alleviation programme of government. Besides, the roads would be cleared of the menacing and eye sore blockage by this mountainous rubbish for free vehicular and pedestrian movement. It is also recommended that the Health Education unit of the local authority should be adequately strengthened and funded in order to perform its traditional role/duty of informing, educating and communicating. The information, education and communication components of health educational programme should be strengthened in order to address knowledge, attitude and belief of the selling and buying population.

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