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Research Article

Determination of Human Parasitic Infestation on Fruits and Vegetables Sold in Ekpoma Markets, Edo State, Nigeria

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Abstract: Fruits and vegetables commonly brought for sale in markets within Ekpoma in Esan West Local Government Area of Edo State were screened for human parasites in medical laboratory science department Research and diagnostic laboratory in College of Medicine, Ambrose Alli University, Ekpoma, Edo State. Two hundred and fifty (250) samples of seven different vegetable types which include cabbage, carrot, spinach, pumpkin, cucumber tomatoes and waterleaf and two different types of fruits which are pineapple and garden egg were obtained in three different markets within Ekpoma and screened using centrifugation method (Simple Sedimentation) and Floatation method. Cysts, ova, larvae and trophrozoites of intestinal Protozoa and helminthes were recovered. 106 (42.4%) of the samples were positive for different species of parasites. The parasites implicated were *Entamoeba coli* 21 (20.5%), *Entamoiba histolytica* 11 (10.4%), 4(3.6%), *Giardia lablia* 4 (3.6%), *Hymenolepis nana* 1 (0.9%), *Trichuris trichiura* 2 (1.9%), *Ascaris lumbricoides* 12 (11.3%), Hookworm 14 (13.2%), *Strongyloides stercoralis* 34 (32.1%), *Gastrodiscoides hominis* 1(0.9%) *and Faciola species* 1 (0.9%). *Strongyloides*. *stercoralis* with 34 (32.1%) of the positive cases has the highest occurrence, while *H. nana, G. hominis* and *Faciola species* with1 (0.9%) had the least occurrences. The study also showed that water-leaf with 83.3% infestation rate has the highest parasitic infestation, while cucumber with 0 (0.0%) has zero infestation. Spinach was found to have the highest multiple parasitic infestation of seven (7) species, whereas, cucumber had none. Infestation of different vegetables and fruits by various species of parasites was statistically significant ($p<0.05$; $X^2 = 108.41$). The infestation of medical important parasites and non-medical important parasites that were recovered in this project was found to be statistically significant ($p<0.05$; $X^2 = 9.845$). Results from this current study however show high level of fruit and vegetables infestation with intestinal parasites and also indicate a great risk of acquiring intestinal parasites by eating improperly processed fruits and vegetables, but it can be excluded from the cycle of transmission of parasitic infections by properly and hygienically prepared fruits and vegrtables before consumption and proper waste management.

Keywords: Ekpoma, fruits, medical and centrifugation, parasites, vegetable

INTRODUCTION

A parasite is an organism that resides on or within another living organism, the host in order to find the environment and nutrients required for its own growth and reproduction (Ochei and Kolhatkor, 2000) or it is an organism that is entirely dependent on another organism referred to as its host, for all or part of its life cycle and metabolic requirement (Arora and Arora, 2010). The ingestion of parasites by mouth is one of the commonest method of transmission of the parasites which can get to the intestine by ingestion of the food or water contaminated with faeces containing the infective stages of the parasites or ingestion of improperly cooked food, meat and vegetables or the ingestion of raw vegetables and fruits (Ochei and Kolhatkor, 2000) and by parasitic infestation it means the external parasitism of the parasites living on the external surfaces of the body (Ochei and Kolhatkor, 2000).

The cultivation of vegetables for commercial and domestic purposes in Nigeria is mostly carried out by farmers that depend on natural rainfall or irrigation (Luka *et al*., 2000) and these vegetables though seasoned are cultivated in the same piece of land every year, as a result of these continuous land usage, there is depletion of the nutrient hence the need for fertilizer or manure. Most farmers use untreated animals and humans faeces as manure, which are known to contain various species of parasites that are of both medical and veterinary importance (Okoronkwo, 1998) and the indiscriminate faecal deposition in bushes and farm land and the belief that deposition of such waste product will fertilize the land have further made the practice common by farmers and unlearned citizens and some of the water bodies used for irrigation are also

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polluted with parasites infected excreta, that could lead to recycling of infection (Ayer *et al*., 1992). It was also reported that the potential risk factors for humans intestinal parasitic infection caused by *Ascaris lumbricoides, Trichuris trichiura, Ancylostoma duodenale, Necator americanus, Balantidium coil, Giardia intestinalis, Blastocystic homimis,* involves unhygienic associations with unhygienic environment (Altekruse *et al*., 1997). Vegetables in its broadest sense refer to any kind of plant life or plant product, it is also commonly referred to as the edible portion of an herbaceous plants, roots, stems, leaves or fruits. These plants are either eaten fresh or prepared in a number of ways (Encyclopedia Britannica, 1969). It is a known fact that the use of excreta- polluted irrigation water is a health risk to the farmers and the consumers of the corps so produced. Raw wastewater frequently contains high numbers of eggs of human intestinal nematodes (Ayer *et al*., 1992). It has also been established that Market vegetables and fruits are often contaminated by eggs of human intestinal nematodes where night soil is extensively used as fertilizer or where wastewater reuse is practiced. Both crops consumed and the agricultural workers have been identified as being at risk from soil and waste-water transmitted infections. The direct application of night soil, animal manure and waste-water manure as an agricultural fertilizer has being practiced for centuries in many parts of the world, particularly in the Asian subcontinent and other continents like Africa (Shuval, 1986). The practice of using wastewater and animals and human waste is gaining prominence in developing countries as a result of the growing cost of mineral fertilizers and because of the increasing demand for basic food supplies. Indirect reserve of river which contains a substantial percentage of municipal refuse and sewage is also taking place in many developing countries (World Health Organization, 1999). Epidemiological studies have indicated that in areas of the world where helminthic diseases are endemic in the population, are where raw untreated waste-water is used to irrigate vegetables generally eaten uncooked. Fruits and vegetables gotten from fruits and vegetables cultivated using waste-water may lead to parasitic infestation which invariably leads to parasitic infections (Mara and Caira, 1989). Therefore, this paper examines the human parasitic infestation of vegetables and fruits sold in Ekpoma markets.

MATERIALS AND METHODS

Study Area: Ekpoma, the study area is a town located in Esan West Local Government Area, Edo State, Nigeria. It is located between 6.700 N and longitude 6.130 E having a population of about 61.870 people whose occupations include farming, trading, civil service and studentship (National Population Commission, 2007). Some of the neighboring communities around Ekpoma Town are Uhiele, Emuhi, Illeh and Ujemen. Some of the neighboring Towns include Iruekpen, Irrua, Uromi and Ubiaja.

Study design: A cross-sectional systematic sample survey was undertaken at different markets in Ekpoma, which include The Ekpoma main market, Royal market and Irukepen Market.

Inclusion criteria: Only vegetables and fruits brought to the study markets were used in this survey.

Exclusion criteria: vegetables and fruits outside the study area were not used in this study.

Study duration: This study was carried out from August, 2012 to February, 2013.

Sample collection: The samples includes Tomatoes, Spinach, Pumpkin leaf, Water leaf, Pineapples, Garden eggs, Carrots, Cabbages and cucumber were bought randomly from the different markets, labeled with date of collection, name of the sample, time and place of collection. They were then taken to the laboratory for examination.

Examination of samples: Each of the samples was examined carefully with the method described by Damen *et al*., (2007) at the parasitology unit of Medical Laboratory Science Department, Diagnostic and Research Laboratories, College of Medicine, Ambrose Alli University, Ekpoma.

Statistical analysis: Chi-square statistical analysis was then used to determine the various comparisons and the significant level was set at 95% confidence level, $\alpha = 0.05$, $p>0.05$ was interpreted as not statistically significant while $p<0.05$ was interpreted as statistically significant.

RESULTS

Out of a total of 250 samples which comprised of 195 samples of seven types of vegetables and 55 samples of two types of fruits collected in the three different markets in Ekpoma, 106 were infested with intestinal parasites giving an overall infestation rate of 42.4% (Table 1).

The parasites encountered include some species of protozoa and helminths. The protozoa parasites were Amoeba- *Entamoeba histolytica* and *Entamoeba coli* and Flagellates-*Giardia lamblia;* the helminth parasites

Table 1: Overall infestation of the samples

Total no. examined	Total no. positive	%
250	106	42.4

Table 2: Prevalence of infestation of parasites on fruits and vegetables sold in Ekpoma markets

Markets	N (Examined)	N (Positive)	Percentage (%)	p-value
Iruekpen	70	34	48.6	
Royal	70	26	37.1	>0.05
Ekpoma main	110	46	41.8	
Total	250	106	42.4	

(X^2cal = 5.736,α = 0.05, p val. = 0.0568, X^2tab =1.386) D.f. = 2; X^2cal = chi-square calculated; X^2tab= chi- square tabulated; D.f. = Degree of freedom; N = number

Table 3: Infestation rate on each of the fruits and vegetables examined

Type of vegetables/fruits	NE	NP	Overall percentage (%)	SP (%)
Water leaf	30	25	10.0	83.3
Spinach	30	20	8.0	66.7
Cucumber	30	0	0.0	0.0
Cabbage	25	9	3.6	36.0
Garden egg	25	15	6.0	60.0
Carrot	25	15	6.0	60.0
Pineapple	25	5	2.0	20.0
Tomato	30	13	5.2	43.3
Pumpkin leaf	30	4	1.6	13.3
Total	250	106	42.4	382.0

(X^2cal = 43.943, α = 0.05, p val. = 0.00000058) D.f. = 8; X^2cal = chi-square calculated, D.f. = Degree of freedom; NE = Number Examined; NP = Number Positive; SP = Specific Positivity

Table 4: Infestation on different fruits and vegetables by various species of human parasites stages

Species of parasite	WL	SP	CU	CB	GA	CA	PP	TO	PU	p-value
Entamoeba coli	3	1	0	4	7	4	2	6	1	<0.05
Entamoeba histolytica	1	3	0	0	4	0	0	3	1	
Strongyloides stercoralis	12	8	0	0	4	5	0	2	0	
Ascaris lumbricoides	4	2	0	0	0	4	0	0	2	
Hookworm	3	4	0	0	0	2	3	0	0	
Gastrodiscoides hominis	0	0	0	1	0	0	0	0	0	
Giardia lablia	0	1	0	2	0	0	0	1	0	
Hymenolepis nana	0	0	0	1	0	0	0	0	0	
Faciola species	0	0	0	1	0	0	0	0	0	
Trichris trichura	0	1	0	0	0	0	0	1	0	
Total	25	20	0	9	15	15	5	13	4	

(X^2cal =108.41, α = 0.05, p val. = 0.00033, t-ratio =14.24) D.f. = 6;X^2cal = chi-square calculated, t-ratio; D.f. =Degree of freedom; WL = Waterleaf; SP = Spinach; CU = Cucumber; CB = Cabbage; GA = Garden egg; CA = Carrot; PP = Pineapple; TO = Tomatoes; PU = Pumpkin leaf

were Cestodes-*Hymenolepis nana;* Trematodes-*Gastrodiscoides hominis* and *Fasciola species* and Nematodes-*Trichuris trichiura, Strongyloides stercoralis*, *Ascaris lumbricoides* and Hookworm.

Table 2 show the intensity of infestation in different markets; the highest prevalence of 34 (48.60%) positive cases occurred in Iruekpen market, while the lowest prevalence of 26 (37.1%) occurred in Royal market Ekpoma.

Table 3 shows the infestation of various vegetables and fruits with water leaf having 25(10%) and 83.3% of positive specific percentage had the highest infestation while cucumber with 0(0.0%) and 0% of positive specific percentage had the lowest infestation.

Table 4 shows the infestation of different vegetables and fruits by various species of parasites with spinach found to have the highest poly- parasitic infestation of seven species of parasites, whereas cucumber was found to have nil and the analysis shows that infestation of different vegetables and fruits by various species of parasites shown to be statistical significant ($p<0.05$; X2 = 108.41).

DISCUSSION

In this study, a total of 250 samples comprises of 195 different types of vegetables and 55 different types of fruits were examined, out of which 106 (42.4%) were positive for different stages of different parasites. The result of this study is similar to the study carried out by Ali *et al*.,(2005) in Saudi Arabia where 26.0% contamination was recorded, Rodina and Saleh (2007) reported 37.0% in Gaza Palestine, in (Damen *et al*., 2007) reported 36.0% contamination in Jos Nigeria, Abougrain *et al*. (2009) in Iran reported 58.0%, Uga *et al*. (2009) reported 26.0% prevalence of infestation in Hanoi market in Vietnam, Ojemudia (2011) reported 56.3% prevalence of infestation in different markets in Jos Nigeria, Amaechi *et al*. (2011) reported 65.8% prevalence of infestation on vegetables and 34.2% prevalence of infestation on fruits in markets in Owerri Nigeria, Alli *et al*. (2011) reported 35.4% prevalence of infestation in market in Ibadan Nigeria, Glenn *et al*. (2012) reported 45.0% prevalence of infestation in metro Manila markets in Philippine while Omowaye and Audu (2012) reported 11.87% prevalence of infestation in Kogi market in Kogi Nigeria. The difference in the prevalence recorded in some of the studies done in other places can be attributed to the differences in sample sizes used, the techniques employed. The particular period of the year at which those studies were done could also affect the outcome. Damen *et al*. (2007) reported that there are high recovery of more stages of parasites on vegetables and

fruits at the summer because the organisms are attached more to them than in the winter when rain washes some of them off into water bodies and hygienic practises in those areas. *Strongyloides stercolaris* with 34 (32.1%) prevalence of infestation was the highest in this study which was in line with Ojemudia (2011), Damen *et al*. (2007),Omowaye and Audu (2012), who found *Strongyloides stercolaris* to have the highest contamination in their independent studies, although the percentage prevalence of infestation differs which could be attributed to difference techniques employed and also differences in the sample size used. The high prevalence of *Strongyloides stercolaris* could be because *Strongyloides stercolaris* life cycle has both parasitic and free living phases which enhance its proliferation. This agrees with the work of Feachem *et al*. (1980), whereas Alli *et al*. (2011), Abougram *et al*. (2009), Glenn *et al*. (2012) reported contrary, Alli *et al*. (2011) reported Hookworm with prevalence of 32.3% as the highest in their study which could be attributed to difference in the distribution of parasites in different geographical location in the world, also the climatic conditions and differences in hygienic practices could contribute. When the distribution of the parasites on the different fruits and vegetables were compared, the difference was not statistically significant ($p > 0.05$, $X^2 = 21.902$) which could be attributed to the same hygienic practices and similar means of waste management. World Health Organization (1999) reported that for community that have similar means of waste management and also get the same sources of water they are bound to have similar infections . All the three markets studied were found to be infested with different stages of the parasites but their distribution was not statistically significant ($p>0.05$, $X^2 = 4.39$). Water leaf with specific positivity percentage of 83.3% and overall percentage of 10% had the highest contamination while for cucumber both specific positivity percentage and overall percentage of 0.0% were the lowest. The difference could be because water leaf has a retaining structure (texture) than cucumber and also has more fluid content than cucumber and most importantly water leaf is cultivated at the back of homes where human and animal faeces are used as growth enhancer (manure). Spinach was found to parasites. This is in line with the work of Ojemudia (2011) who reported.

Conclusively, this study shows that vegetables and fruits sold in Ekpoma markets environs are highly contaminated with human parasites. This could be responsible for the high prevalence of intestinal human parasites in the study area. This study also affirms that consumption of poorly prepared food could serve as a major means of transmission.

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