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Assessment of Enteric Helminthes Ova on Ready to Eat Selected Vegetables (Garden Egg, Cucumber and Carrot) in Ushongo LGA of Benue State

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Abstract: The aim of this work was to investigate the level of enteric helminthes ova contamination on ready to eat selected vegetables in Ushongo Government of Benue state. The sampling locations comprised of three major markets: Ikyobo, Lobi and Lessel markets. A total of 270 samples were collected, 90 samples in each market (30 carrots, 30 garden egg and 30 cucumber). The samples were transported aseptically to the laboratory for egg analysis using centrifugation, microscopy and standard identification guide. Carrot was the most contaminated vegetable with a total of 63 contaminated samples out of 90 samples, hence percentage contamination was 70%. Cucumber and garden egg had percentage contamination of 57% and 55% respectively. From a total of 270 vegetable samples investigated, 175 were contaminated with helminthes egg, thus resulting in 64.8% vegetable contamination in Ushongo LGA. Based on market type and location, contamination was highest in Lessel market (72.2%) followed by Lobi market (63.3%) and Ikyobo market (58.8%). Vegetable contamination in the three location was statistically the same (χ^2=1.76, P>0.05) as there was no significant association between market locations and the number of contaminated vegetables. In cucumber, *Entamoeba histolytica* was the highest contaminant (39%) followed by *Entamoeba histolytica* (17%), and *Giadia lamblia* (12%). In carrot samples, *Entamoeba coli* (21%) and *Entamoeba histolytica* (21%) were the most occurring eggs isolated. This was followed by *Chilomastix mesnili* (16%) and *Iodamoeba buestchili* (10%). Others are: *Trichuris trichiura* (8%), *Ascaris lumbricoides* (6%), *Entamoeba nana* (6%) and *Ancyclostoma duodenale* (5%). In garden egg, *Giardia lamblia* was the most common contaminant (33%). Also found were species of the genera *Entamoeba* and other species found in cucumber. A total of 14 egg types of different species were identified. *Entamoeba histolytica* (20%), *Entamoeba coli* (19%), *Giardia lamblia* (17%) and *Chilomastix mesnili* (10%) were the top four egg contaminants. Others species occurred in <10%. The high prevalence of enteric helminthes ova across the various markets was a reflection that vendors, producers and consumers are prone to parasitic attacks as a result of eating raw or uncooked vegetables in the study area. The information given in this report is crucial in the prevention of disease outbreaks associated with enteric helminthes in the study area.

Keyword: Contamination, Enteric helminthes, Ushongo LGA, Vegetables

Introduction

Vegetables are important component of a healthy diet rich in a number of essential vitamins including Vitamin C, Vitamin B12, Niacin and Riboflavin and mineral element such as iron (Syngletary *et al*., 2005). Despite the health benefits, vegetables have been known to serve as vehicle to human disease causing agents. The channels through which vegetables get to the final consumers are possible routes of contamination and any unhygienic practices in their preparation could lead to incidence of human illness or infection resulting from the consumption of contaminated products. Consumption of raw or unhygienically prepared vegetables is considered a risk factor for human parasitic infection (FAO, 2010). Helminthes are worm-like organisms living in and feeding on living hosts. They receive nourishment and protection while disrupting their hosts' nutrient absorption. This can cause weakness and disease of the host. Those helminthes that live inside the digestive tract, of humans and other animals are called intestinal parasites. In their adult forms, helminthes cannot multiply in humans (CDC, 2014). Helminthes are able to survive in their mammalian hosts for many

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years due to their ability to manipulate the immune response by secreting immunomodulatory products (Jirillo *et al.*, 2014).

All helminthes produce eggs (also called ova) for reproduction. These eggs have a strong shell that protects them against a range of environmental conditions. The eggs can therefore survive in the environment, outside their hosts for many months or years. Many but not all of the worms referred to as helminthes belong to the group of intestinal parasites. An infection by a helminth is known as helminthiasis, helminthes infection or intestinal worm infection. (CDC, 2014). Vegetables can become contaminated with enteric helminthes throughout the process of planting to consumption, the extent of contamination depends on some factors such as use of treated waste-water and water supplies contaminated with sewage as an organic agricultural fertilizers and for irrigation coupled with the unhygienic practices of the farmers during harvest, post harvest handling by vendors, poverty and hygienic conditions of preparation (Amoah *et al.*, 2007). The consumption of vegetable and outbreak is increasing daily as consumers strive to eat healthy diet and benefit from the year round availability of these products that up till recently were considered to be seasonal, global trade in vegetables and change in horticultural practices have enable this year round abundance to be possible, However, recent epidemiological reports have shown a high risk associated with vegetable consumption due to parasitic contamination if not properly handled. Ushongo Local Governmemt Area of Benue State in Nigeria is popular in the production and marketing of vegetable crops in high volumes. The three major markets are major locations where many vegetables are sold and distributed to many parts of the State. The aim of this work was to investigate the level of enteric helminthes ova contamination on ready to eat selected vegetables in Ushongo Government of Benue state.

Materials and Methods

Study Area

This study was carried out in Ushongo LGA of Benue State, Nigeria. The headquarter is Lessel,

It is bounded at the North by Gboko Local Government Area and Buruku Local Governments Area, South at by Vandeikya Local Government Area, East at the Kwande Local Government Area, and West by Konshisha Local Government Area. Agriculture is the mainstay of the people's economy. With predominantly local tools, agricultural products are produced in varying degrees across the local government area. In more cases, such products serve a dual purpose as both cash and food crops. Indeed, just as Benue State is regarded as the food basket of the nation, Ushongo may well pass as the food basket of Benue State. Citrus fruits and mangoes are the principal products of Ushongo people. Indeed, Ushongo local government is the singular largest producer of citrus fruits in the whole of Benue State.

Study locations and sample collection

The sampling sites comprised of three major markets in Ushongo Local government which include: Ikyobo market, Lobi market and Lessel market. A total of 270 samples were collected, 90 samples in each market (30 carrots, 30 garden egg and 30 cucumber). The samples were transported aseptically to the laboratory for analysis.

Sample analysis

Samples were washed with physiological normal saline (0.85%NaCl). The suspensions were strained through a clean sieve to remove undesirable materials. The top layer was discarded and the remaining was centrifuged at 2000rpm for 15minutes as described by Adamu *et al.* (2012). The supernatant was discarded and the sediment was carefully mixed and a drop placed on grease free slide with the addition of a tiny drop of iodine. A clean cover slip was gently placed to avoid air bubbles and over flooding.

Isolation and identification of parasites

The method used for the identification and isolation of enteric helminthes ova was microscopic examination. The Enteric helminthes ova were examined under the microscope using x10 and x40 objective lenses. The ova were identified as described by Cheesbrough (2004) and Castro and Baron, 1996).

Results and Discussion

Table 1 presents the occurrence of contamination of vegetables in the three markets.in total, carrot was the most contaminated vegetable with a total of 63 contaminated samples out of 90 samples, hence percentage contamination was 70% as shown in Figure 1. Cucumber and garden egg had percentage contamination of 57% and 55% respectively. From a total of 270 vegetable samples investigated, 175 were contaminated with helminthes egg, thus resulting in 64.8% vegetable contamination in Ushongo LGA. Similar findings was reported in Jos markets and in Maiduguri where fresh vegetables were found to be highly contaminated with parasitic eggs (Adamu *et al.*, 2012; Idahosa, 2011). Based on market type and location, contamination was highest in Lessel market (72.2%) followed by Lobi market (63.3%) and Ikyobo market (58.8%) as shown in Figure 2. In Lessel market, garden egg was the most contaminated vegetable (24 out of 30 samples). In Lobi market, it was carrot (26 out of 30 samples) and in Kyobo market it was cucumber (20 out of 30 samples). Vegetable contamination in the three location was statistically the same (χ^2=1.76, P>0.05) as there was no significant association between market locations and the number of contaminated vegetables. The three markets had equal chances of fruit contamination depending on the level of hygiene by the farmers, handlers and the source of contaminants.

Table 1: The frequency of vegetable contamination in different markets within the study area

	Vegetables			
Markets	Cucumber	Carrot	Garden egg	Total
Lessel	22	19	24	65 (72.2%)
Lobi	15	26	16	57 (63.3%)
Ikyobo	20	18	15	53 (58.8%)
Total	57 (63.3%)	63 (70%)	55 (61.1%)	175 (64.8%)

χ^2=1.76, P>0.05

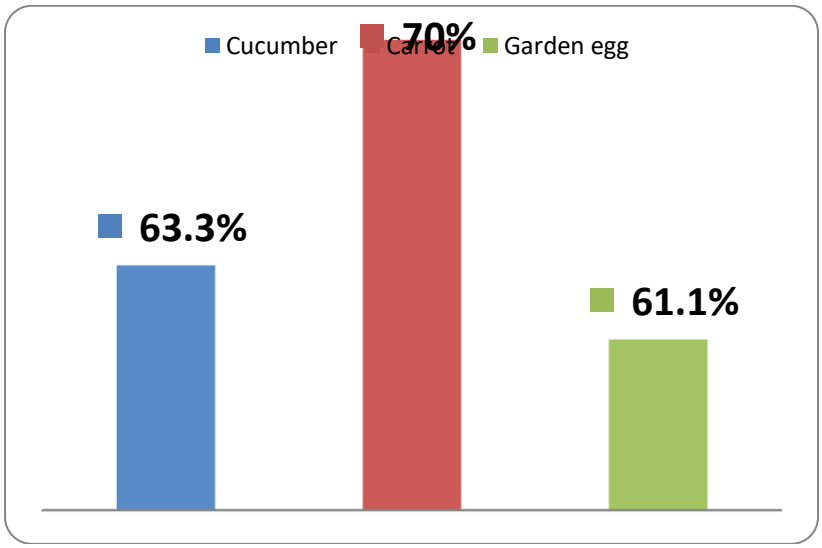

Figure 1: Percentage of vegetable contamination based on vegetable type

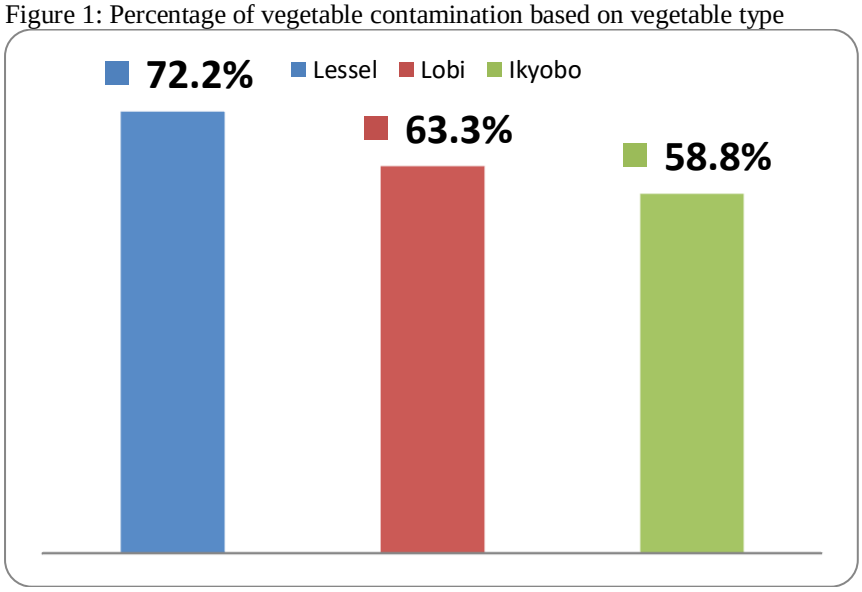

Figure 2: Percentage of vegetable contamination based on market type

Table 2 presents the frequency of egg density in cucumber. *Entamoeba histolytica* was the highest contaminant (39%) occurring more in Lessel market than other locations. This was followed by *Entamoeba histolytica* (17%) occurring Lobi and Ikyobo markets. *Giadia lamblia* (12%) occurred equally in the three markets. Other isolated contaminants were *Entamoeba nana* (9%), *Entamoeba dispar* (9%), *Hymenolepsis* (5%), *Giardia duodenalis* (5%) occurring in only Lobi market and *Blastocystis hominis* (4%) present in only Ikyobo market. Thus, genus *Entamoeba* was the preponderant genera of contaminants in cucumber samples analysed in the study area. Consumers of cucumber are predisposed to diseases such as dystenteria, diarrhea and amoebiasis caused by *Entamoeba* infection. The affected locations are also at risk of disease outbreak.

Table 2: Frequency of helminthes egg density in Cucumber

	Markets				
Parasites	Lobi	Lessel	Ikyobo	Total frequency of contamination	% occurrence
Entamoeba histolytica	-	14	8	22	39
Entamoeba coli	4	-	6	10	17
Entamoeba nana	3	-	2	5	9
Blastocystis hominis	-	-	2	2	4
Giadia lamblia	3	2	2	7	12
Entamoeba dispar	1	4	-	5	9
Hymenolepsis	1	2	-	3	5
Giardia duodenalis	3	-	-	3	5
Total	15	22	20	57	100

Table 3 gives the egg density isolated in carrot samples *Entamoeba coli* (21%) in two locations and *Entamoeba histolytica* (21%) occurring in all locations were the most occurring eggs isolated. This was followed by *Chilomastix mesnili* (16%) occurring in all locations and *Iodamoeba buestchili* (10%) found in only Ikyobo market. Others are: *Trichuris trichiura* (8%), *Ascaris lumbricoides* (6%), *Entamoeba nana* (6%) and *Ancyclostoma duodenale* (5%). Carrot samples contained more diverse species type as samples recorded all types of eggs isolated from protozoans and helminthes from different species. Worm infestation and other types of food borne diseases are likely to develop from carrot consumers. Table 4 presents the nature of eggs found in garden egg. *Giardia lamblia* was the most common contaminant (33%) and it occurred in all locations. Also found were species of the genera *Entamoeba* and other species found in cucumber. Table 5 shows at a glance the frequency of occurrence of eggs among the 175 positive vegetable samples. A total of 14 egg types of different species were identified. *Entamoeba histolytica* (20%), *Entamoeba coli* (19%), *Giardia lamblia* (17%) and *Chilomastix mesnili* (10%) were the top four egg contaminants. Others species occurred in <10%.

Table 3: Frequency of egg density on Carrot

Parasites	Markets			Total frequency of contamination	% of occurrence
	Lobi	Lessel	Ikyobo		
Giardia lamblia	5	-	-	5	8
Chilomastix mesnili	2	4	4	10	16
Entamoeba nana	2	2	-	4	6
Ancyclostoma duodenale	3	-	-	3	5
Entamoeba coli	8	-	5	13	21
Entamoeba histolytica	5	5	3	13	21
Trichuris trichiura	1	4	-	5	8
Iodamoeba buestchili	-	-	6	6	10
Ascaris lumbricoides	-	4	-	4	6
Total	26	19	18	63	100

Table 4: Frequency of egg density on Garden egg

	Markets				
Parasites	Lobi	Lessel	Ikyobo	Total frequency of contamination	% of occurrence
Chilomastix mesnili	2	1	3	6	11
Iodamoeba buestchili	1	-	3	4	7
Entamoeba dispar	-	-	1	1	2
Giardia lamblia	6	4	8	18	33
Ascaris lumbricoides	-	2	-	2	4
Entamoeba coli	-	11	-	11	20
Blastocystis hominis	4	6	-	10	18
Entamoeba nana	3	-	-	3	5
Total	16	24	15	55	100

Table 5: Total Parasitic occurrence of all parasites in vegetable samples

Parasites	Total	(%) of occurrence
Entamoeba histolytica	35	20
Entamoeba coli	34	19
Iodamoeba belli	6	3
Chilomastix mesnili	16	10
Giardia lamblia	30	17
Entamoeba nana	12	7
Ancyclostoma duodenale	3	2
Trichuris trichiura	5	3
Ascaris lumbricoides	6	3
Iodamamoeba buestchilli	4	2
Entamoeba dispar	6	3
Blastocystis hominis	12	7
Giardia duodenalis	3	2
Hymenolepsis	3	2
Total	175	100

The high prevalence (37.1%) of Enteric helminthes ova recorded in Lessel could be attributed to exposure to predisposing factors such as, poor sanitary and hygienic conditions, unsafe sources of water and lack of awareness on the part of consumers and vendors This result is consistent with previous findings (Aguoru *et al.,* 2015). The trend of parasitic infection reported through routine diagnosis is partly a factor of vegetables being sources of transmission (Al-Binal *et al*., 2006). The presence of intestinal parasites in vegetable samples is suggestive of faecal contamination as vegetables adequately harbor the infective forms of the parasites. Producers are also in the habit of using untreated animal dung and the use of raw affluent from human or animal wastes as manure leading to the transmission of zoonotic infection. The consumption of vegetables raw or undercooked is a possible way by which the transmission of these parasites is encouraged.

This is in agreement with previous work (Jimenez-Gonzalez *et al*., 2007; Gibson, 1994) where high incidences of intestinal parasites were associated with environmental pollution and poor level of hygiene. In a similar study (Berger *et al*., 2000) conducted in other continent, Hookworm egg contamination was the highest contaminant isolated fruit samples whereas *Entamoeba histolytica* was the highest contaminant in the present report. The difference could be attributed to many prevailing conditions such as: different geographical location, climatic factors, environmental conditions, the general behavioral attitude to hygiene and the socio-economic activities of producers, vendors and consumers (Jimenez-Gonzalez *et al*., 2007; Maya *et al*., 2012). It is obvious that vegetables consumed by people of Ushongo LGA are quite often contaminated with parasites, more especially by enteric helminthes ova. This might be responsible for the high cases of diseases such as cholera, typhoid, dysentery and other food borne diseases present in the study area. Amoah *et al*. (2007) and Aguoru *et al*. (2015) earlier suggested the use of common and improved sanitary washing method in many parts of Africa for the reduction of coliform bacteria and helminth eggs on fruits and vegetables sold in markets

Conclusion

Vegetables produced and sold in Ushongo LGA of Benue State are heavily contaminated with helminthes egg. This has implications in the health of the public. Farmers, vendors and consumers should be enlightened on the danger of consuming unwashed vegetables. Hygienic practices must be preached. Carrot was the most contaminated vegetable. From a total of 270 vegetable samples investigated, 175 were contaminated with helminthes egg belonging to 14 different species of helminthes, thus resulting in 64.8% level of vegetable contamination in Ushongo LGA. The three markets had equal chances of fruit contamination depending on the level of hygiene by the farmers, handlers and the source of contaminants.

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