An Assessment of Helminthes Ova on Ready to Eat Vegetables Within Kaduna Metropolis, Kaduna State, Nigeria

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Abstract: Intestinal parasitic diseases are still a public health problem in the developing countries, probably due to poor sanitation and inadequate personal hygiene. Sixty (60) fresh vegetables comprising of 30 carrot *(Daurus carota)* and 30 garden egg *(Solamun aethiopicum)were* collected from farmers within Kaduna metropolis and examined using simple ordinary sedimentation concentration method for the presence of helminthes ova.Out of the 60 samples examined, 13(21%) samples were positive for helminthes contamination. Four helminthes eggs were detected, which include *Ascaris lumbricoides*, Hookworm, *Schistosoma mansoni* and *Fasciola species*, with percentage occurrence of 3(5%), 5(8.3%), 4(6.7%) and 1(1.7%) respectively. Higher prevalence was recorded in carrot 9(30%) compared to 4(13.3%) recorded in garden egg. The study has revealed the potential risk of contracting intestinal infections through ingestion of locally grown, unwashed vegetables even though the p-value was 0.208 which is greater than 0.05, hence there was no statistical significant difference.

Keywords: Intestinal parasites, Vegetables, Helminthes, Kaduna.

Introduction

Vegetables in broadest form refer to any kind of plant life or plant products. It is commonly referred to as the fresh edible portion of herbaceous plants roots, stem, leaves or fruits. These plants are either eaten fresh or prepared in various ways (Damen *et al.*, 2017). Fresh vegetables are important part of healthy diet and often contain a number of essential vitamins and minerals, carbohydrates, dietary fiber and phytochemicals. Previous studies have showedthe presence of helminthes eggs and protozoa cysts in fresh vegetables reported to be agents of gastrointestinal infections (Damen *et al.*, 2017). Quite a number of helminthes eggs such as those of *Ascaris lumbricoides, Trichuris trichiura,* and hookworm have been isolated and documented from various categories of vegetables from developing countries (Dada *et al.*, 2015).

Persistence in the use of wastewater resource has been attributed to several factors, including the decreasing availability of water resources for irrigation as a result of the increasing demand for potable water in urban and peril-urban communities Williams *et al.*, (2014).

Other contributing factors include the high cost of artificial fertilizers, the realization that nutrients in wastewater can increase crop production (yield) and the social acceptance of the practice as well as dependence by large populations for their livelihoods. The sources of contamination extend beyond the use of wastewater on farms (Dada *et al.*, 2015).

Post-harvest treatment of vegetables includes handling, washing, storage, transportation, sorting, packing, cutting and further processing equipment, and both poor hygienic and poor personal hygiene practices during food preparation, and/or contact with contaminated soil or fecal matter (Andoh *et al.*, 2009). The health hazards associated with the direct and indirect use of wastewater on rural health and safety for those working on the land or living on or near the land where the water is used and the risk that contaminated products from the wastewater use area may subsequently infect humans or animals through consumption or handling of the foodstuff or through secondary human contamination by consuming foodstuffs from animals that used the area can never be over emphasized (Chessbrough, 2015).

The highest health risk associated with the use of waste water is theoretically for helminths infections, since helminths persist for long periods in the environment (from a few months up to 30 years) and host immunity ranges from low to non-existent and the infective dose is small (WHO, 2017).

Epidemiological studies have indicated that in areas of the world where helminthic diseases are endemic in the population and where raw untreated waste water is used to irrigate vegetables generally eaten uncooked, the consumption of such waste irrigated vegetables may lead to parasitic infection (Damen *et al.*, 2017).

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Aim

This study therefore aimed at assessing helminthes ova(eggs) from vegetables within Kaduna metropolis.

Materials and Method

Study Area

The study was conducted within Kaduna metropolis of Kaduna State, Nigeria, which is located in the North-Western part of the country at latitude 10.51^{0}N and longitude 7.42^{0}E. Kaduna metropolis is located within the tropical continental climate (Ajeye *et al.* 2018) with two distinct seasons –wet and dry. The vegetation type found in the study area is southern Guinea Savana type characterized by thick woodlands, tall grasses and herbs with riparian forest along streams and river banks (Udo, 1981). The Guinea savanna is the broadest of all the vegetation type in Nigeria, covering area which has 1000mm to 1500mm of annual rainfall where the rainy season last for 6 months (Ajeye *et al.*, 2018). The primary risk groups are the peasant farmers of very low western education and their children between the ages of 5 to 17 years who participate actively in the farming business.

Sample Collection

Sixty (60) samplesof vegetables comprising of 30 carrots and 30 garden eggs were collected from randomly selected vegetable farmers within Kaduna metropolis. The samples were collected early in the morning immediately after harvest from the farm, and then transported to the laboratory of the Department of Microbiology, Kaduna State University, Kaduna for analysis.

Laboratory Examination of the samples

The samples were examined carefully Macroscopically for the presence of adult worms or segments of parasites such as *Teania species* then transferred into labeled sterile big glass beaker after which, the samples were washed with 150mls of distilled water, and allow to stand on the bench for one hour for proper sedimentation. The supernatant (the upper layer of the water used in washing the vegetables) were discarded leaving about 15mls at the bottom. Ten (10) ml of the deposit was transferred into a centrifuge tube and centrifuged for 15min at 1000rpm. The supernatant was discarded, while the deposit was transferred into a clean grease free glass slide. A drop of iodine was added to stain the cysts and covered with a cover slip carefully to avoid air bubbles. The slide was examined with a microscope at 10x and 40x objectives, and recorded the value for cysts and ova of parasites according to Cheesbrough, (2015).

In order to facilitate the inferential analysis of the sampled data, the following hypotheses were set.

Hypothesis

1. Ho: No relationship between vegetable-type and number of parasites Ova found to be positive.

   H1: There is a relationship between vegetable-type and number of parasites found to be positive.

2. Ho: No relationship between parasite-type and number of ova of parasites detected.

   H1: There is a relationship between vegetable-type and number of ova of parasites detected.

Methods of Data Analysis

The data obtained from the experiment were subjected to descriptive and inferential statistics. Specifically, tables were used to present the data to provide snap shot available information in the sampled data. In order to established significance result for data, chi-square test of independence was used. Chi-square test is a hypothesis test for determining whether two categorical variables are related in any way. The test determines whether there is a significance difference between the observed and expected frequencies in one or more categories, and observations usually classified into mutually exclusive classes. The chi-square test statistic was defined by

$$\chi^2 = \sum_{i=1}^{n} (O_i - E_i)^2 / E_i, \quad (1)$$

where O_i and E_i are the observed and expected frequencies, respectively. The significance of the result depends on a pre-specified significance level (α-level) and the degrees of freedom. For this paper we choose the alpha level to be $\alpha = 0.01$, this is in consistence with the usual value used for medical and life science researches.

Result and Discussion

The revelation of the presence of helminthes ova from vegetables is of great public health significance. This is because some of the vegetables are eaten raw; in addition people often pick up fallen vegetables and unwashed vegetables from farms after merely dusting off the dirt with their unwashed hands and cloth.

The samples were first of all examined macroscopically (using necked eyes) for the purpose of checking for presence adult worms (parasites) or their parts or segments. However, none was found positive macroscopically.

From the chi-square results in **Table 2**, theχ^2value was found to be 1.588 with 1 degree of freedom and the P-value was 0.208 which is greater than 0.05. Thus, result was not statistically significant

and therefore it is concluded that there is no relationship between vegetable type and the number of parasite ova found to be positive in the study area (Kaduna Metropolis). However, it can be seen from **Table 1** that the prevalence was found to be higher in carrot 9 (30.0%) compared to garden egg 4(13.3%).

The high percentage of contamination of carrot could be attributed to the fact that carrot is a vegetable that grow in the soil and thus have direct contact with any contaminated soil and hence be easily contaminated with helminthes eggs during watering and application of organic manure. On the other hand Garden egg have smooth cellophane-like skin covering which probably shielded them off their contaminants while Carrot has a rough dented surface that can harbor parasite eggs, also couple with the fact that Garden egg vegetables (fruits) develop above the soil level, that give them the advantage of not easily contaminated by infected soil and hence their lower contamination with helminthes eggs.

Out of the total number of vegetable samples analyzed (60), 13(21.7%) were contaminated (Table 1). The result was lower than 31.7% and 66.7% (Doaa, 2012., Dada *et al.*, 2015). These differences in prevalence could be as a result of farming practice employed by the farmers such as type of manure used and the water used for irrigation. High incidence of intestinal parasites have been found in communities that consume vegetables, especially those cultivated on farms fertilized with untreated human and animal manure (Damen *et al.*, 2017).

Four different types of helminthes eggs (ova) were identified in this study; these include *Ascaris lumbricoides*, Hookworm, *Schistosoma mansoni* and *Fasciola spp.* with prevalence of 3(5.0%),5(8.3%),4(6.7%) and 1(1.7%) respectively (Table 3). The P-value was 0.461 (Table 4) which is higher than 0.05 hence this result revealed that there is no statistical significant difference in relationship between the Parasite types and number of helminthes eggs examined during this study in the study area.

This could be due to the fact that most intestinal parasites and their ova have similar environmental factors and temperature requirement for their survival. Similar helminthes eggs were also isolated by Andoh *et al.* (2009); Doaa, (2012) and Dada *et al.* (2015).

Table 1: Prevalence of Helminthes Ova on Ready to Eat Vegetables

Vegetable	Number Examined	Number Positive (%)
Garden Egg	30	4(13.3)
Carrot	30	9(30.0)
Total	**60**	**13(21.7)**

Table2: Chi-Square Tests to determine whether there exist a relationship between vegetable-type and number of parasites Ova

	Value	Df	p-value
Pearson Chi-Square	1.588[a]	1	.208
Continuity Correction[b]	.909	1	.340
Likelihood Ratio	1.631	1	.202
Fisher's Exact Test			
Linear-by-Linear Association	1.566	1	.211
N of Valid Cases	73		

Table 3: Percentage Occurrence of Helminthes Ova in Ready to Eat Vegetables

Parasite-Type	No Of SamplesExamined	Number detected (%)
Ascaris	60	3(5.0)
Hookworm	60	5(8.3)
S. mansoni	60	4(6.7)
Fasciola	60	1(1.7)

Table 4: Chi-Square Tests to determine whether there exists a relationship between parasite-type and number of ova of parasites detected

	Value	Df	p-value
Pearson Chi-Square	2.583[a]	3	.461
Likelihood Ratio	2.993	3	.393
Linear-by-Linear Association	.724	1	.395
N of Valid Cases	253		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is 3.13.

Conclusion and Recommendation

The study has revealed the potential risk of contracting intestinal infections through ingestion of locally grown unwashed vegetables. The overall prevalence of helminthes eggs was found to be 21.7%. Carrot was found to be more contaminated 30.0% than garden egg 13.3%. The helminthes egg isolated were *Ascaris lumbricoides*, Hookworm, *Schistosoma mansoni* and *fasciola*.

From this study it can be concluded that all individuals that are consumers of ready to eat vegetables are all at risk of intestinal parasites infection in respective of age or gender except where the ready to eat vegetables are hygienically prepared before consumption.

There should be awareness campaign programmes in respect to the use of Untreated human excreta, animal dung or raw sewage should not be used as fertilizer in agriculture unless decomposed to destroy the ova and larvae of helminthes by heat generated or ammonium sulphate should be added to the fresh faeces to strength of 12% to destroy the hookworm embryo within 24 hours.

Pipe-borne water and bore-hole should be made available to the populace to replace rivers and other bad sources of water supply and should be treated before use to water or wash vegetables. Mass treatment of infected farmers and the general public is highly recommended, especially in the rural areas where peasant farming is being practiced. The Government of Kaduna State should enforced the law on environmental sanitation and ensure proper disposal of sewage and faecal matter in both rural and urban areas of the state.

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