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Prevalence of Human Parasites Associated with Vegetables Sold in Maikatako Market of Bokkos L.G.A Plateau State, Nigeria

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Abstract

The importance of vegetables to human health and wellbeing cannot be overemphasized as they form a major component of a healthy diet. This study is aimed at determining the prevalence of human parasites associated with vegetables in Maikatako Market. A total of two hundred (200) vegetable samples were collected in Maikatako market of Bokkos Local Government Area between the months of October through December, 2016 for analysis. The vegetables sampled include cabbage, carrot, garden egg, lettuce, spinach, spring onions, tomatoes, cucumber, bitter garden egg and green pepper. The vegetables were screened for the presence of parasites using normal saline sedimentation technique. Of the 200 samples collected and analyzed, 69 (34.5%) were positive for the presence of intestinal parasites. Tomatoes had the highest contamination rate of 14 (7.0%) followed by spinach 10 (5.0%), while garden egg and green pepper had contamination rate of 3 (1.5%) each. Among the parasites encountered, *Entamoeba histolytica* had the highest prevalence rate of 27 (13.5%) followed by hookworm with a prevalence rate of 16 (6.0%) while *Gardia lamblia* and *Ascaris lumbricoides* each had the least rate of prevalence of 6 (4.0%). Statistically, there is a significant difference between the parasites isolated and the vegetables studied ($p < 0.05$). The result of this research is an indication that human parasites can be acquired through the consumption of these vegetables, especially when not properly and hygienically prepared before taken to market.

Keywords: Vegetables, Parasites, Maikatako.

Introduction

Vegetables are essential to human well being as they form a major component of a healthy diet. Their benefits range from the maintenance of health to prevention of diseases (Hanif *et al.*, 2006). Consuming fruits and vegetables assists the immune system to protect the body against a series of diseases by providing nutrients, vitamins, minerals, protein, and fibers. It could also have a positive impact on body-weight regulation and related conditions, including diabetes and hypertension. To this end, the Joint FAO/WHO Expert Consultation on diet, nutrition and the prevention of chronic diseases, has recommended the intake of a minimum of 400g of vegetables and fruits per day for the prevention of chronic diseases such as cancer, heart diseases, diabetes, and obesity, as well as for the prevention and alleviation of several micronutrient deficiencies, especially in less developed countries (World Health Organization, 2003). However, fruits and vegetables, especially when consumed raw or improperly washed, has been the precursor of transmission of human pathogens (Abougrain *et al.*, 2010; Berger *et al.*, 2010; Idahosa, 2011).

In most cases, contamination of vegetable and fruits is associated with the water used for irrigation or poor handling by vegetable/fruit vendors (Simoes *et al.*, 2001). Various factors contribute to increase in diseases associated with raw fruits and vegetables. They include use of untreated wastewater and manure as fertilizers for crop production, irrigation and various agronomic practices, level of hygiene of food handlers (James and Ogochukwu, 2006). Infection from contaminated vegetables can be controlled and prevented by adequately washing the fruit or vegetable in clean water before consumption. The need to re-focus on health promotion and education on the mode of transmission of disease, environmental sanitation and personal hygiene and eating habits will enhance the prospect for the control of parasitic infections in Nigeria.

Materials and Methods

The samples used for this research were collected from Maikatako Market in Bokkos Local Government Area of Plateau State, Northern Nigeria. It is located at 9°18'00"N, 9°00'00"E with an area of 1,682 km² and a

population of 178,454 at the 2006 census. Languages spoken in Bokkos are Ron, Mushere and Kulere. The major occupation of the people of Bokkos is farming (Plateau State Government, 2017).

A total of 200 samples of 10 different types of vegetables were randomly purchased from Maikatako Market in Bokkos Local Government Area, Plateau State, Northern Nigeria between the month of October through December, 2016. The vegetable samples include spinach, cabbage, carrot, garden egg, bitter garden egg, tomato, cucumber, spring onion, lettuce and green pepper. These vegetables were collected into sterile, labeled (with date of collection) polythene bags and transported to the laboratory in the Department of Parasitology at University of Veterinary and Animal Sciences, Lahore within 3h of collection for the examination and were studied within 24 hours. Spoiled, damaged and vegetables with excessive dirt were not collected. The sample was collected once a week based on their market days for six weeks.

Portion of the samples (200g) were weighted into sterile nylon bags and were carefully examined macroscopically for the presence of segments of cestodes and adult nematodes. A portion (200g) of each fruit and vegetable was washed separately in 500ml of normal saline for detaching the parasitic stages (ova, larvae, cysts, and oocysts) of helminthes and protozoan parasites commonly assumed to be associated with vegetable contamination. After overnight sedimentation of the washing solution, 15ml of the sediment was transferred to a centrifuge tube using sieve; this is to remove undesirable matters. For concentrating the parasitic stages, the tube was centrifuged at 3000rpm for five minutes (Idahosa, 2011). After centrifugation, the supernatant was decanted carefully without shaking. Then the sediment was agitated gently by hand for redistributing the parasitic stages. Finally, the sediment was examined under a light microscope using $\times 10$ and $\times 40$ objectives. The eggs/cysts were identified based on morphological details as described by Soulsby (1982).

Data and laboratory findings were organized and analyzed using the computer program statistical package for social science (SPSS) version 16. In the statistical comparison between the groups, the significance of difference was analysed using the Z test to compare the proportion between two groups of qualitative data. Intergroup comparison of categorical data was performed by using chi square test (χ^2 value). A Pvalue < 0.05 was considered statistically significant.

Results and Discussion

Out of the 200 samples of the ten types of vegetables, 69 (34.5%) were positive for intestinal parasites. Tomato had the highest contamination rate of 14 (70%) followed by Spinach 10 (50%) while Garden egg and Green Pepper had the least contamination rate of 3 (15%) each. Hajjami *et al.*, (2013) from Morocco reported that about 60% of samples they analyzed were contaminated with different intestinal parasites. Fagbenro *et al.*, (2016) equally reported the high level of contamination of green vegetables involving intestinal parasites (73.5%) in Abeokuta, Ogun State, Nigeria. Several studies around the world, into the recovery of parasites from vegetables sold in markets or collected from wholesale have been conducted and showed their presence with a high prevalence (Akhlaghi *et al.*, 2000; Davami *et al.*, 2000; Zohour & Molazadeh 2001; Dayrani 2008; Abougrain *et al.*, 2010). There is no significant difference between the contamination rates ($p > 0.05$).

Table 1: Prevalence of parasites on vegetables in Maikatako market

Vegetables	Number Examined	Number Positive	Percentage Positive (%)
Bitter Garden egg	20	5	25
Tomato	20	14	70
Cabbage	20	7	35
Spinach	20	10	50
Carrot	20	6	30
Lettuce	20	8	40
Spring onion	20	5	25
Garden egg	20	3	15
Green pepper	20	3	15
Cucumber	20	8	40
Total	200	69	34.5

Table 2 below shows the distribution of the parasite on the different vegetables sampled. The result showed that *E. histolytica* had the highest infection rate of 27 (13.5%) followed by Hookworm 16 (6.0%), while *G. lamblia* and *A. lumbricoides* had the least infection rate of 6 (4.0%) respectively. This agrees with Maysa *et al.*, (2014) who reported 0.06% prevalence rate for *A. lumbricoides* in Egypt. In Plateau State, Nigeria, the contamination rate was 2.4% (Idahosa, 2011). Statistically, there is a significant difference ($P < 0.05$) between the parasites isolated and the ten (10) vegetables sampled.

Table 2: Parasite distribution among the vegetables sampled in Maikatako Market

Vegetables	<i>E. histolytica</i> (%)	<i>E. coli</i> (%)	<i>G. lamblia</i> (%)	<i>A. lumbricoides</i> (%)	Hookworm (%)
Bitter Garden egg	0 (0.0)	3 (15)	0 (0)	0 (0)	2 (10)
Tomatoes	8 (40)	3 (15)	2 (10)	0 (0)	1 (5)
Cabbage	2 (10)	1 (5)	0 (0)	0 (0)	4 (20)
Spinach	3 (15)	0 (0)	1 (5)	2 (10)	4 (20)
Carrot	4 (20)	1 (5)	1 (5)	0 (0)	0 (0)
Lettuce	3 (15)	0 (0)	2 (10)	3 (15)	1 (5)
Spring onion	3 (15)	0 (0)	0 (0)	0 (0)	2 (10)
Garden egg	0 (0)	2 (10)	0 (0)	0 (0)	1 (5)
Green pepper	1 (5)	2 (10)	0 (0)	0 (0)	0 (0)
Cucumber	4 (20)	2 (10)	0 (0)	1 (5)	1 (5)
Total	27 (13.5)	14 (7.0)	6 (4.0)	6 (4.0)	16 (6.0)

Conclusion and Recommendation

In conclusion, this study highlighted the importance of raw fruits and vegetables as the potential source nutrients, vitamins, minerals, protein, and fibers and of transmission of intestinal parasites to humans. The fruits and vegetables contamination with the pathogenic parasites poses a health risk to the consumers if consumed without proper cleaning and or cooking. This research shows the presence of intestinal parasites on the vegetable and fruit samples examined. Although the disposal of wastewater on agricultural fields has a lot of benefits, the use of this water without any treatment poses serious human health risks. The result of this study has shown that there is a high risk of infection with intestinal parasites in the vegetables sampled in the market. The high level of vegetable contamination with parasitic stages is significant hence; consumers should be informed and educated with regard to food safety, good distribution practices and improvement of sanitary conditions in vegetable markets, this will reduce the rate of parasitic diseases.

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