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Survey on the Parasitic Contamination of Fresh Vegetables Sold in Maiduguri Metropolis – Nigeria.

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Abstract

Fresh vegetables are an important part of a healthy diet but it can also be an agent of transmission of intestinal parasites. The aim of this study was to determine the parasitic contamination of fresh vegetables sold in Maiduguri metropolis. A total of 120 samples of fresh vegetables collected from three wards (Gwange, Mairi and University of Maiduguri campus) were examined for parasites using flotation method. A total of 14.8% were positive for intestinal parasites. Among the vegetables examined, cucumber, garden egg, and pea egg plant recorded the highest rate of contamination 5(16.7%) while Carrots recorded the least rate of contamination 3(13.3%). Parasites recovered were *Ascaris lumbricoides* 1 (0.8%), Hookworm 3 (2.3%), *Hymenolepis nana* 11 (8.6%), and *Giardia intestinalis* 4 (3.1%). In conclusion, this study indicates that parasites are common in vegetables that are frequently eaten raw and may pose a great risk to the acquisition of parasitic infestation.

Keywords: Fresh vegetables, Maiduguri, Parasites, Contamination, Survey

Introduction

Food borne illnesses caused by intestinal parasites are still a major problem in developing countries (Del Manso *et al.*, 2009). About one third of the world, more than two billion is infected with intestinal parasites (Brooker, 2010). Food becomes a potential source of human infection by contamination during production, transport, preparation or processing (Slifko *et al.*, 2000).

Vegetables are essential for good health and they form a major part of human diet in every family. They are vital energy contributors which are depended upon by all human as food supplement or nutrient (De Oliveira and German, 1992). Since vegetables require a moist environment for their growth, particularly those eaten raw and without peeling have been demonstrated to be a source of transmitting a wide range of parasites (Al-Sher et al., 2005). Several surveys in different part of the world indicated that vegetables can be an agent for transmission of protozoan cysts and oocysts (*Giardia*, *Entamoeba*, *Cryptosporidium*, *Cyclospora*, *Isospora* and *Toxoplasma*) and helminth eggs and larvae (Voung *et al.*, 2007, Darchankora *et al.*, 2006, Choi and Lee, 1972). According to many studies, there is a strong association between vegetables, especially raw ones and parasitic infestation (Daryani *et al.*, 2012 and Fawzi *et al.*, 2004). Vegetables are extensively used in different parts of the country, but unfortunately people do not know how to consume them properly. Previous studies have revealed that many types of vegetables purchased at market were contaminated with parasites (Robertson and Gjerde, 2001; Harghighi *et al.*, 2009 and Ogbolu *et al.*, 2009). Some previous studies in Nigeria have reported the rate of vegetables contamination from 11.87% to 56% (Chan *et al.*, 2014; Jonathan and Fierer, 2013; Heaton and Jones, 2007 and Karomoko *et al.* 2007). Epidemiological research performed has shown that the social and economic situation of an individual is an important factor in the prevalence of intestinal parasites. In addition, poor sanitary and

environmental conditions are known to be relevant in the propagation of these infections agent (Mentz, 1993). The aim of the present study was to determine the parasitic contamination of raw vegetables sold in Maiduguri, the level of contamination and the most prevalent parasite that contaminates vegetables sold in Maiduguri metropolis. The findings from this study could potentially open a new avenue of research in vegetables and could also lead to better practices in growing and handling vegetables to protect against intestinal parasites infestations.

Materials and Method

Study Area

The study area, Maiduguri metropolis lies on latitude 11° North and longitude 13° east. Borno State shares borders with Republic of Niger to the North, Chad to the North -East and Cameroon to the East. It has a population of 4,098.391 according to 2006 census report. Maiduguri is a cosmopolitan city which is inhabited by various ethnic groups common in the Kano State (www.bornostate.gov.ng).

Areas of sampling

The vegetables were collected from 3 different wards within Maiduguri metropolis, they include; University of Maiduguri main campus, Mairi and Gwange ward. The vegetables were collected from retail traders hawking vegetables in these 3 wards. Most of these vegetables are from gardens and whole sale markets within the metropolis. The samples were collected during dry season between February and March, the period when irrigation is mostly practiced and majority of farmers use human and animal faeces as manure instead of the commercially processed fertilizer in order to limit their cost.

Sample Collection

The vegetables collected for the study were carrots, cucumber, garden egg and pea egg plant. The vegetables were randomly collected in batches of 40 (10 for each vegetable) per ward and wrapped in sterile polythene bags and labeled accordingly. A

total of 120 samples of vegetables were collected and transported to the laboratory for analysis.

Sample processing

The vegetables were washed in about 200ml of normal saline and allowed to stand on the bench for about 1hour. The supernatant was discarded and the sediment was sieved into a clean centrifuge tubes. The washing solutions were centrifuged at 3000 rpm for 5 minutes. The supernatants were discarded and the sediment were transferred on to a clean grease free slide and covered with a clean cover slip avoiding air bubble and over flooding. The preparation was examined microscopically using 10x and 40x objectives respectively with the condenser iris sufficiently closed to give good contrast. Identification of the helminth ova and larvae was done as described by Cheesbrough (1998).

Result

A total number of 120 samples of 4 different vegetables were examined for parasitic contamination. Of the 120 vegetables examined 29(24.2%) were positive for parasites while 101(78.9%) of the vegetables were negative for parasites. Among these vegetables, cucumber, garden egg and pea egg plant had the highest frequency of parasites which is 5(16.7%) and the lowest was carrots which was 4(13.3%). Table 1 shows the number of each vegetable examined and the percentage of their contamination. Cucumber, garden egg and pea egg plant have the highest (16.7%) rate of parasitic contamination while carrot has the lowest (13.3%) rate of parasitic contamination. Table 2 shows the percentage of parasitic contamination in each ward. Mairi ward has the highest rate of contamination which is 22.5% and University of Maiduguri campus has the least rate of contamination which is 7.5%. Table 3 shows the frequency of parasites isolated from the 120 vegetables examined in this study. The parasites isolated were ova of *Ascaris lumbricoides* 1(0.8%), cyst of *Giardia intestinalis* 4(3.1%), ova of *Hyemenolepis nana* 11(8.6%) which has the highest occurrence, and Hookworm 3 (2.3%).

Table 1: Number of vegetables examined and the percentage of contamination of each vegetable.

VEGETABLES	GWANGE	MAIRI	UNIMAID	CAMPUS	(%) OF POSITIVE VEG.
CUCUMBER	10	10		10	5(16.7)
GARDEN EGG	10	10		10	5(16.7)
PEA EGG	10	10		10	5(16.7)
CARROTS	10	10		10	4(13.3)
TOTAL	40	40	40		63.4

Table 2: Percentage of contamination of vegetables sampled in each ward.

WARD	NUMBER OF POSITIVE	PERCENTAGE (%) OF CONTAMINATION
GWANGE	7	17.5
MAIRI	9	22.5
UNIMAID CAMPUS	3	7.5

Table 3: Type and frequency of parasites isolated from the vegetables sampled.

PARASITIC	FREQUENCY	PERCENTAGE
Al	0	0
Gl	4	3.1
Hn	11	8.6
Hw	3	2.3
TOTAL	19	14.8%

Key: Al- *Ascaris lumbricoides*, Gl- *Giardia intestinalis*, Hn- *Hymenolepis nana*, Hw- Hook worm.

Discussion

Intestinal parasites are very common in developing countries. Fresh vegetables are an important route of their transmission. A total number of 120 samples of fresh vegetables were examined, out of which 19 (14.8%) were positive for intestinal parasites. Among the vegetables examined, cucumber, garden egg and pea egg plant recorded the highest rate of contamination (16.7%) while carrot recorded the least contamination rate (13.3%). The result of this study is similar to a research conducted in Saudi, Arabia Iran and Kogi, Nigeria where they obtained a prevalence of 16%, 15% and 11.85 respectively (Omowoye and Audu, 2012; Saeed et al., 2012 and Wafa and Mergin, 2010). In another study by Damen and colleagues (2007) in Jos, a 36% parasitic

contamination was reported (Damen et al., 2007). The difference in the prevalence of intestinal parasites contaminated vegetables could be attributed to geographical difference. The vegetables used for this study are usually brought from farms in the rural areas and gardens around the metropolis. The cultivation of these vegetables is usually amplified with the application of fertilizer or manure, though use of untreated human or animal feces as manure is the most frequently used approach in this area and most parts of country. Another important factor is the use of untreated waste water for irrigation. Epidemiological studies have shown that where raw untreated waste water is used for irrigation of vegetables which are eaten raw, helminthic diseases tend to become endemic in

such communities (Gupta and Santra, 2010; Uga et al., 2009 and Ortega et al., 1997).

The vegetables used for this study are those hawked within Maiduguri metropolis. These vegetables are usually washed with tap water by the sellers. People of this region and most parts of the country have the habit of directly consuming hawked raw vegetables at any time without rewashing in salt water or addition of vinegar. A similar study conducted revealed that tap water does little to remove parasites from vegetables (Al-Binali *et al.*, 2006).

Result from this study shows that Mairi ward recorded the highest prevalence (22.5%), Gwange ward recorded a prevalence rate of 17.5% whereas UNIMAID Campus recorded the least contamination rate which is 7.5%. The high prevalence rate of contamination in these 2 wards (Mairi and Gwange) may be due to the fact that these wards are characterized by poor drainage systems, improper disposal of sewage and poor hygiene practices.

Some of parasites recovered from this study that which was recovered from other studies. Four different types of parasites were isolated from the study. They include ova of *Ascaris lumbricoides* 1 (0.8%), *Hymenolepis nana* 11 (8.6%), Hookworm 3 (2.3%) and cyst of *Giardia intestinalis* 4 (3.1%). The presence of these parasites on the vegetables examined may be due to the fact that these parasites can withstand a wide variety of adverse environmental conditions which could serve as an indication of water pollution as a result of indiscriminate defecation resulting in pollution of water and farmlands as previously observed by Damen and colleagues (2007) or it may due to poor hygiene practice in handling of these vegetables (Ogbolu et al., 2009). Faecal contamination of water sources used for irrigation is an important source of contamination. Once the vegetables are contaminated with parasites; tap water does little to remove these parasites. Therefore, contamination of fresh vegetables is of great public health concern.

Conclusion

This study shows that parasites are common in vegetables that are frequently eaten raw and may pose a great risk of acquiring intestinal parasitic

infections by eating inadequately washed fresh vegetables.

Recommendation

Enlightenment programs for the public on necessity of food sanitation and personal hygiene should generally be intensified. The local health and environmental authorities should educate the public on the health hazards of fresh vegetables and government should also provide inorganic fertilizers at affordable rates to farmers in order to discourage the use of animal and human feces as fertilizers. Also, the treatment of irrigation water before use should be adopted.

References

Al-Binali, A.M., Bello, C.S., El-Shewy, K. and Abdulla, S.E. (2006). The prevalence of parasites in commonly used leafy vegetables in South Western, Saudi Arabia. *Saudi Medical Journal*; **27**(5): 613-616.

Born, State of Nigeria. Accessed from www.borno.gov.ng

Barker, (2010). Estimating the global distribution and disease burden of Intestinal Nematode infections: adding up the numbers - a review. *International Journal of Parasitology*; **40** (10):1137-1144.

Chan, Q.H., Thong, H.T., Chao, N.V., Hung, P. H., Vun, V.H. *et al.* (2014). Microbial and Parasitic Contamination of Fresh Vegetables sold in Traditional Markets in Hue City, Vietnam. *Journal of Food and Nutrition Research*; **2**(12): 959-964.

Cheesbrough, M. (2005). *District Laboratory Practical in Tropical Countries 2nd Edition* Cambridge University Press Part 1: 218-239.

Choi, D.W. and Lee, S. (1972). Incidence of parasites on vegetables collected from markets and vegetables garden in Taegu area. *Korean Journal of Parasitology*; **10**:44-45

Damen, J.G., Banwat, E.B., Egah, D.Z. and Allamana, J.A. (2007). Parasitic Contamination of Vegetables in Jos, Nigeria. *Annal of African Medicine*; **6**(2): 115-118.