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Original Research Article

Isolation of Intestinal Parasites in Vegetables Sold in Major Markets in Akure, Ondo State, Nigeria

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ABSTRACT

Background: Vegetables in nature are very important sources of nutrients to the body, which plays a fundamental role in homeostasis.
Aim: Commercially traded vegetables in the metropolitan city of Akure market were analyzed by means of sedimentation method with the view to discovering and identifying protozoan cyst and ova of helminthes of medical interest.
Materials and Methods: The vegetables consisted of 15 samples of each of the varieties from the 3 different markets in Akure listed below. Arowojeja tete (*Amaranthus hybridus*), Gbure (Water leaf) (*Talinum triangulare*), Soko (*Celosia argentea*) and Ugu (*Telfairia occidentalis*).
Results: There were high rates of contamination in all the varieties of vegetables analyzed except Ugu leaf (*Telfairia occidentalis*). However, the water leaf (*Talinum triangulare*) was the one which presented the highest frequencies of parasites. The Soko leaf (*Celosia argentea*) recorded the least whereas the Ugu leaf had no parasites discovered in the varieties analyzed.
Discussion and Conclusion: The parasites which occur frequently in the population is from Ojo Oba. The most frequent being ova of *Ascaris lumbricoides* (51.9%), ova of Hookworm (26%), Cyst of *Entamoeba histolytica* (18.5%) and eggs of *Enterobius vermicularis* is least (3.7%) were also recovered from the samples, thus corroborating the occurrence of high rates of feacal contamination. The results were analyzed using % and CHI Square method which shows that there is no significant difference between the numbers of parasites in the varieties of vegetables in the three markets.

Keywords: vegetables, parasitic contamination, Akure, markets, *Ascaris lumbricoides*

INTRODUCTION

Vegetables in its broadest sense, refers to any kind of plant life or plant products. It is commonly referred to as the fresh edible portion of a herbaceous plant roots, stems leaves and fruits. These plants are either eaten fresh or prepared in number of ways. [1]

The earliest humans spent the majority of their waking hours looking for food that is hunting animals and gathering fruits and vegetables. Fruits, the fleshy portions of a plant which protect and nourish a seed, were common only in the springtime, though some fruits such as apples did mature later. Vegetables, on the other hand, are the stems, leaves, or roots of plants and could be harvested almost year round. Nevertheless, fruits and vegetables were by no means common or consistent in the pre-historical lives of human beings. [2]

Early civilizations, such as Sumerians, Babylonians, Greeks and Chinese, Cultivated a variety of fruits and

vegetables both for their nutritional value and also because of their aesthetic value. Vegetables such as onions, garlic and radishes were cultivated in early Egyptian society as part of the average diet and to provide flavor for other dishes. Still, preservation was sometimes problematics, in some cultures fruits were dried and stored for winter, but rarely lasted until spring. [2]

Soil transmitted helminth (STH) infection is endemic in many areas of the world, principally in developing countries with poor environmental sanitation and personal hygiene. Since the mode of infection is fecal-oral route, prevalence is high in people who live in areas contaminated with human feces. Akure is a high endemic area for STH infection as shown by epidemiological survey of STH by local institutions has been carried out in 20 0f 36 provinces in Nigeria. Of these provinces, 17 showed greater than 50% prevalence of parasitic diseases. Uga [3] investigated the intestinal parasites of school children in one province (not one of the 17 provinces mentioned above), using the centrifugal sedimentation technique, and revealed that 166 (76%) of 217 were positive for at least one of nine species of parasites. This study, together with that of Hoek [4] indicates that prevalence of parasitic diseases in Akure is relatively high in Ondo state.

Since STH infection is mainly established by oral intake of infective eggs and/or oocysts from various sources have been reported, for example soil, dust, hands, fingers, nails or water and vegetables. Of these, vegetables are thought to be the principal source of STH infection as they are consumed daily. Previous studies have revealed that many types of vegetables, purchased in different markets in the regions, were contaminated with helminth eggs, as well as protozoan oocyst. Although these reports have emanated from developing countries, no study has been performed in Akure, except one in Ilorin in a local journal. In addition, there are no reports from Akure discussing the relationship between parasitic infection of humans and contamination of vegetables by parasite eggs.

Information on intestinal parasites prevalence in fresh vegetables sold in Akure and the neighbouring town markets is not available. This information is required to assist the local health authorities to be able to take proper actions to improve the quality of such foods. In recent years Akure cities has been opened to local travel and tourism which makes such information of paramount importance to the local community as a whole. Therefore, the main objective of the present study was to determine the parasitological contamination of fresh vegetables sold in wholesale and retail markets in Akure city.

MATERIALS AND METHODS

Study Area

This study was carried out in Akure, the capital city of Ondo state and it lies between latitudes 45′ and 52′N and longitudes 20′ and 05′E. its land area is about 15,500 square kilometres. Ondo state is bounded on the east by Edo and Delta States, on the west by Ogun and Osun States, on the north by Ekiti and Kogi States and to the South by the Bight of Benin and the Atlantic Ocean.

Area of Sampling

These vegetables were picked from three different major markets (Oja Oba, Ojai Isolo and Oja Isikan) all in Akure metropolis, Ondo State. These markets were considered because majority of the farmers from different local government areas of Ondo State convey their farm products, which include the above mentioned vegetables for sale in these markets.

Collection of Samples for the study

Vegetables used in this study were Arowojeja tete leaf (*Amaranthus hybridus*) Gbure (water leaf) (*Talinum triangulare*), Soko leaf (*Celosia argentea*), Ugu leaf (*Telfairia occidentalis*). A total of 180 samples of Arowojeja tete leaf, Gbure, Soko and Ugu leaf were picked randomly from the above market to obtained qualitative

estimation of parasitic contamination of these vegetables.

Sample Analysis

Macroscopic Examination

Each of the samples was examined carefully for the presence of segment of cestodes and adult nematodes.

Procedure for washing the Samples:

The vegetables were washed for the removal or elution of parasitic ova, larva or cyst. This was done using washing method described by Gaspard and Schwartzbrod. [5] In this method, the experimental protocol consisted of the elution of eggs from the vegetable substrate and concentration. Concentration of the eggs was done by centrifugation technique described by Stein and Schwartz. [6] The preparation was filtered through wet gauze into a clean one liter conical flask to remove debris and then dispensed into clean centrifuge tubes and centrifuged at 5000 rpm for 5minutes, the supernatant was discarded into disinfectant jar and the sediment was mixed and a drop was applied on the center of a clean grease-free slide, a cover slip was placed gently to avoid air bubbles and over flooding. The preparation was examined under the microscope for parasites using x10 and x40 objectives.

RESULTS

Table 1: Types of Parasites on Vegetables in Oja Oba Markets

Vegetables	Type of Parasites	No. of Parasites
Arowojeja tete leaf (*Amaranthus hybridus*)	Ova of *Ascaris lumbricoides*	1
	Ova of Hookworm	1
Gbure (water leaf) (*Talinum triangulare*)	Ova of *Ascaris lumbricoides*	2
	Cyst of *Entamoeba histolytica*	1
	Egg of Hookworm	1
	Entarobius vermicularis	nil
Soko leaf (*Celosia argentea*)	Ova of *Ascaris lumbricoides*	2
	Entamoeba histolytica	1
Ugu leaf (*Telfairia occidentalis*)	No ova or cyst seen	nil

Table one above shows the parasite types on vegetables in Oja Oba market, *Ascaris lumbricoides* has the highest prevalence on all the vegetables type, followed by *Entamoeba histolytica*, while the least parasite is Hookworm.

Table 2: Types of Parasites on vegetables in Oja Isolo Markets

Vegetables	Type of Parasites	No. of Parasites
Arowojeja tete leaf (*Amaranthus hybridus*)	Ova of *Ascaris lumbricoides*	1
	Ova of Hookworm	1
Gbure (water leaf) (*Talinum triangulare*)	Ova of *Ascaris lumbricoides*	2
	Cyst of *Entamoeba histolytica*	1
	Egg of Hookworm	1
	Entarobius vermicularis	nil
Soko leaf (*Celosia argentea*)	Ova of *Ascaris lumbricoides*	1
	Entamoeba histolytica	1
Ugu leaf (*Telfairia occidentalis*)	No ova or cyst seen	nil

Table two above shows the parasite types on vegetables in Oja Isolo markets, *Ascaris lumbricoides* has the highest prevalence on all the vegetables type, followed by *Entamoeba histolytica*, while the least parasite is Hookworm.

Table 3: Types of Parasites on vegetables in Oja Isikan Markets

Vegetables	Type of Parasites	No. of Parasites
Arowojeja tete leaf (*Amaranthus hybridus*)	Ova of *Ascaris lumbricoides*	2
	Ova of Hookworm	1
Gbure (water leaf) (*Talinum triangulare*)	Ova of *Ascaris lumbricoides*	2
	Cyst of *Entamoeba histolytica*	1
	Egg of Hookworm	1
	Enterobius vermicularis	1
Soko leaf (*Celosia argentea*)	Ova of *Ascaris lumbricoides*	1
	Entamoeba histolytica	1
Ugu leaf (*Telfairia occidentalis*)	No ova or cyst seen	nil

Table three above shows the parasite type on vegetables in Oja Isikan market, *Ascaris lumbricoides* has the highest prevalence on all the vegetables types, followed by *Entamoeba histolytica*, while the least parasite is hookworm.

Table 4: Number of Parasites in the Varieties of Vegetables in the Three Markets

Vegetables	Oja Oba	Oja Isolo	Oja Isikan
Arowojeja tete leaf (*Amaranthus hybridus*)	2	3	2
Gbure (water leaf) (*Talinum triangulare*)	4	5	4
Soko leaf (*Celosia argentea*)	3	2	2
Ugu leaf (*Telfairia occidentalis*)	nil	Nil	nil
Total	9	10	8

Of the three markets Oja Isolo had the highest number of parasites on vegetables followed by the least Oja Isikan

Table 5: Cross Tabulation of the prevalence of the parasites in the three markets

Vegetables	Oja Oba	Oja Isolo	Oja Isikan	Total
Arowojeja tete leaf (*Amaranthus hybridus*)	2	2	2	6
Gbure (water leaf) (*Talinum triangulare*)	4	4	4	12
Soko leaf (*Celosia argentea*)	3	2	2	7
Ugu leaf (*Telfairia occidentalis*)	nil	nil	nil	nil
Total	9	8	8	25

Table 6: The Prevalence of Parasites found in Vegetables in all the markets

Parasites	No. of parasites	% of Parasites
Ova of *Ascaris lumbricoides*	14	51.9
Ova of Hookworm	5	18.5
Cyst of *Entamoeba histolytica*	7	26
Enterobius vermicularis	1	3.7
Total	27	100

There is no significance association between the numbers of parasites in the varieties of vegetables in the three markets.

Table 7: Parasitic prevalence on vegetables in the three markets

Vegetables	Parasitic Prevalence
Arowojeja tete leaf (*Amaranthus hybridus*)	7 (25.93%)
Gbure (water leaf) (*Talinum triangulare*)	13 (48.15%)
Soko leaf (*Celosia argentea*)	7 (25.93%)
Ugu leaf (*Telfairia occidentalis*)	Nil
Total	27 (100%)

There is no significance association between the varieties of vegetables and the type of parasites found in them.

DISCUSSION

The findings from this study have shown that parasitic eggs, larvae and cysts can be found at harvest on vegetables grown with human and animal waste and/or by irrigation. Of the 180 samples of vegetables that were collected, processed and examined 160 of them were contaminated with parasites. We found out that water leaf had the highest parasitic contamination (64 %) and Ugu leaf with no parasitic contamination. This could be due to the fact that the degree of contamination varies according to the vegetables. Water leaf, Soko and Arowojeja leaf vegetables has uneven surfaces and makes parasitic eggs, larva attached to the surface of the vegetable more easily, either in the farm or when washed with contaminated water, while Ugu had the least prevalence because of it smooth surface which reduces the rate of parasitic attachment. Water leaf also grows everywhere on its own, either on dunghill or farmland. While Ugu leaf is a climbing plant and may be unpolluted.

Oba market recorded a higher prevalence of (36%) in all the market studied followed by Isolo market (32%) and Isikan market (32%), the highest prevalence of contamination with parasites was found in the vegetables sold in the Oba markets could be attributed to the water used in washing the vegetables. There are ponds and wells near these markets and the women selling these vegetables use the water. The Isolo and Isikan market recorded the least parasitic contamination. This might be due to the fact that the water used in washing the vegetables was pipe borne which has minimal parasitic contamination.

It was remarkable to note that among the four different intestinal parasites identified in the study, *Ascaris lumbricoides* recorded the highest prevalence of (51.9%). The water used in washing the vegetable might introduce this parasite. This followed

by soil transmissible helminths they are indicators of poor socio-economic conditions as well as poor environmental sanitation practices. The presence of protozoa and cestodes might be due to lack of modern toilet facilities, inadequate public health enlightenment and illiteracy that makes people defaecated indiscriminately resulting in pollution of water and farmland.

CONCLUSION

It is conclusive that farming in Akure metropolis leads to parasitological pollution of vegetables especially with viable and infective stage of protozoa, nematodes and cestodes. The findings of this study are similar to previous reports, which had indicated parasitic contamination of locally consumed vegetables. It has also been reported that due to the persistence and ability to withstand a wide variety of adverse environmental condition by helminthes, they could serve as indicators of water pollution.

Our results showed that locally consumed vegetables are often contaminated with human intestinal parasites where there are no good toilets and no proper disposable of feacal waste. Crop consumers and agricultural worker alike, are at high risk of parasitic infections in Akure. This is because the reason given above does not meet the WHO standard [7] and is therefore unsafe for use in the production of Water leaf, Soko leaf, Arowojeja tete leaf and Ugu leaf. One report observed that there is evidence that people consuming vegetables irrigated with raw wastewater are exposed to the risk of infection with ascaris, trichuris, amoeba and tapeworm.

RECOMMENDATION

It is therefore recommended that control measures should includes treatment of irrigation water, municipal wastewater, before use treatment of infected persons, mass education of the populace on the inherent dangers in eating inadequately washed and not well cooked vegetables. Provision of good sanitary system in the rural and urban areas to prevent contamination of soil and water with parasites from poor deposition of faeces should be adopted as the control measure of parasitic contamination of vegetable.

Conflict Of Interest

No conflict of interest expressed in this study.

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