Helminths contaminants of fruits and vegetables sold in rural areas of Zamfara States, Nigeria

* M. M. Shehu and Amina, R. M.

Department of Biological Sciences Usmanu Danfodiyo University Sokoto, Sokoto State, Nigeria

ABSTRACT

Common Fruits and vegetables brought for sale in markets of three districts of Maru Local government of Zamfara State were screened for intestinal helminths parasites in Parasitology Laboratory of Usmanu Danfodiyo University, Sokoto. Two thousand four hundred (2,400) samples of eight different types of fruits and vegetables such as cabbage, lettuce, carrot, spinach, tomatoes, guava, banana and onion were obtained in three different districts markets under the Local Government Area and screened using centrifugation method. Ova and larvae of intestinal nematodes were recovered. Out of the total samples of fruits and vegetables examined, 274 (11.0%) were positive for intestinal helminths parasites. The parasites encountered includes Ascaris lumbricoides 121 (05.0%), Trichuris trichiura 74 (03.0%) Hookworm 52 (02.0%) and Strongyloides stercoralis 27 (01.0%). The highest intensity of 103 (12.87%) positive cases occurred in Kanoma market, while the lowest intensity of 77 (9.62%) occurred in Ruwandoruwa market. The parasitic contamination of different Fruits and vegetables Show that Carrots and Spinach have the highest contamination of parasites, whereas Tomato and Onion showed the least contamination rates. None of the fruits and vegetables had single parasitic contamination. In view of these findings there is an indication that human parasites can be acquired through the consumption of these fruits and vegetables, especially when not properly and hygienically prepare before consumption.

Keywords: Fruits, Vegetables, Geohelminth, Markets, Parasites, Infection, centrifugation.

INTRODUCTION

Infection caused by Soil Transmitted Helminthes are responsible for some of the most frequent disease conditions in tropical and subtropical communities and it is endemic in many areas of the world. [1]; [28]; [29]. Principally, in developing countries with poor environmental sanitation and personal hygiene, the mode of infection is fecal–oral, prevalence is high in people who live in areas contaminated with human feces [1]; [28]. The commonest are Ascaris lumbricoides, Hookworm (Necator americanus and/or Ancylostoma duodenale), Trichuris trichiura and Strongyloides stercoralis [2]; [3].

The cultivation of fruits and vegetables for commercial and domestic purposes in Nigeria is mostly carried out by peasant farmers depend on irrigation or natural rainfall [4]. These fruits and vegetables though seasonal, are cultivated in the same piece of land every year. As a result of this continuous land usage there is depletion of nutrient hence the need for fertilizer or manure. Most farmers use untreated animals and human faeces as manure, which are known to contain various species of parasites that are of medical and veterinary importance. [5]. Indiscriminate faecal disposition in bushes, farm lands and even in present farms with a belief of enriching the lands is also a common practice by farmers and unlearned citizens. Some of the water bodies used for irrigation are also polluted with parasites infected excreta, that could lead to recycling of infection [6]; [28].
Various factors contribute to rapid spread in diseases associated with uncooked fruits and vegetables. These include continued use of untreated wastes water and manure as fertilizers for crop production of fruits and Vegetables are a major contributing factor to contamination that causes numerous food-borne disease outbreak. Soil pollution with faecal materials is instrumental in the transmission of geohelminth infections. Fertilizer eggs deposited in the soil develop rapidly and depending on environmental condition may reach in effective stage within a matter of weeks. Eggs are further transferred from soil to vegetables unto the hand finally to the mouth [7]. The contamination of vegetables by parasites has long been established. Amongst the classes incriminated are Protozoa, Cestodes, Trematodes and Nematodes [8-10]. Approximately, 1.27 billion people are said to be infected [1]. Current estimate by [11] shows that globally there are 800-1,000 million cases of ascariasis, 700-900 million hookworm infection, 500 million of bearing age. They are responsible for significant morbidity worldwide causing an estimated loss of 39 million Disability Adjusted Life Years, DALYs. This disability burden is greater than that due to malaria 35.7 million DALYs [1]; yet in comparison STH is among the most neglected tropical diseases.

Nigeria is one of such areas where infection caused by STH is a public health hazard. Poor socio-economic status; deficiency in sanitary facilities, unsafe human and animal disposal systems, inadequacy and lack of safe water supply are the major prevalent factors among those affected [12-14]. These factors promote transmission of helminth infections from host to host and from soil to host. Faecal-oral transmission through consumption of contaminated foods and water also occur [15]. No previous study on geohelminthes contamination of fruits and vegetables exists in the study area “according to the author's knowledge”. Accordingly, this study was designed to implicate geohelminthes as contaminants on some fruits and vegetables sold in selected districts of Maru Local Government Area of Zamfara State. It will also highlight the health hazard upon consumption, especially children and pregnant women who are the most susceptible in view of their low immunity level and feeding habits.

MATERIALS AND METHODS

Study Area
Maru Local Government Area of Zamfara State has it headquarter in Maru town, it is situated between longitude 6°24’E and latitude 12°20’N. It lies on the North West of Nigeria with a total land area of 6,654 square kilometer, it comprises six districts, each has some satellite villages in form of disperse settlements [16]. Maru Local Government Area has an estimated population of 293,141 people [17]. The research was conducted between the month of January to September, 2012. Rainy season in the area starts early April and ends around October, with a mean annual rainfall of about 1300mm.

Sample collection
The fruits and vegetables screened were cabbage (Brassica oleracea), lettuce (Lactuva sativa), carrot (Daurus carota), guava, Tomatoes (Lycoperisicon esculentum), banana, onion and spinach. They were randomly collected in batches of 100 per fruits and vegetables in each markets in the L.G.A, and wrapped in clean polythene bags and labeled. A total of 2400 samples of fruits vegetables of the eight different types were assayed. The market places from where samples were collected include; Kanoma market, Mayanchi market, and Ruwan-doruwa market, all in Maru LGA.

Screening Procedures
The screening of fruits vegetable samples was carried out in the Parasitology Laboratory of the Usmanu Danfodiyo University, Sokoto.

The method used by [18] was followed with some minor modifications. The samples were washed with formal saline according to their batches in 100 ml round bottom clean plastic container. These were allowed to stand on the bench for one hour to allow time for proper sedimentation. The supernatant was discarded with a Pasteur pipette leaving about 15ml at the bottom. 10ml of the deposit mixture was transferred into a centrifuge tube and spin for five minutes at 3,000 rpm. The supernatant was decanted while the deposit was resuspended with 10% formal saline. This was centrifuged, the supernatant was decanted and the deposit was then transferred to a clean glass slide. A drop of iodine was added to stain the cysts, it was then covered with a cover slip avoiding air bubbles and over floating. 10* and 40* objectives were used for examination.
Statistical Analysis
Chi-square ($x^2$) test was used to determine whether any relationship exists between geohelminthic ova/larvae and contamination of different fruits and vegetables and location of markets.

RESULTS
Out of the 2400 samples of the eight types of fruits and vegetables, 274 were positive for intestinal helminths parasite with a percentage of 11.0%. The parasites encountered includes *Ascaris lumbricoides* 121 (05.0%), *Trichuris trichiura* 74 (03.0%) *Hookworm* 52 (02.0%) and *Strongyloides stercoralis* 27 (01.0%). Table 1, shows the intensity of contamination in different markets; the highest intensity of 103 (12.87%) positive cases occurred in Kanoma market, while the lowest intensity of 77 (9.62%) occurred in Ruwandoruwa market. Table 2, shows the parasitic contamination of different Fruits and vegetables; where Carrots and Spinach was found to have the highest contamination of parasites, whereas Tomato and Onion showed the least contamination parasites.

Table 1: Overall Distribution of Helminths eggs and Larvae recovered

<table>
<thead>
<tr>
<th>Geohelminths</th>
<th>Kanoma +ve ova (%)</th>
<th>Study Areas +ve ova (%)</th>
<th>R/doruwa +ve ova (%)</th>
<th>+ve Larvae (%)</th>
<th>+ve Larvae (%)</th>
<th>+ve Larvae (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. lumbricoides</td>
<td>58 (56.31)</td>
<td>33 (35.10)</td>
<td>30 (38.96)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td>T. trichiura</td>
<td>26 (25.24)</td>
<td>29 (30.85)</td>
<td>19 (24.67)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td>Hookworm</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>13 (12.62)</td>
<td>21 (22.34)</td>
<td>18 (23.37)</td>
</tr>
<tr>
<td>S. stercoralis</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>6 (5.82)</td>
<td>11 (11.70)</td>
<td>10 (12.98)</td>
</tr>
<tr>
<td>Total</td>
<td>84 (21.0)</td>
<td>62 (16.0)</td>
<td>49 (12.0)</td>
<td>19 (5.00)</td>
<td>32 (8.00)</td>
<td>28 (7.00)</td>
</tr>
<tr>
<td>Grand Total</td>
<td>103 (12.87)</td>
<td>94 (11.75)</td>
<td>77 (9.62)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Distribution of helminths ova and larvae on fruits and vegetable in Kanoma, mayanchi and Ruwan-doruwa Markets of Maru Local Government area of Zamfara State, Nigeria

<table>
<thead>
<tr>
<th>Fruits &amp; Vegetable</th>
<th>Kanona No. (+ve)</th>
<th>Mayanchi No. (+ve)</th>
<th>Ruwan-doruwa No. (+ve)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrot</td>
<td>26 (26.0)</td>
<td>22 (22.0)</td>
<td>17 (17.0)</td>
</tr>
<tr>
<td>Banana</td>
<td>12 (12.0)</td>
<td>8 (08.0)</td>
<td>14 (14.0)</td>
</tr>
<tr>
<td>Guava</td>
<td>16 (16.0)</td>
<td>11 (11.0)</td>
<td>12 (12.0)</td>
</tr>
<tr>
<td>Tomato</td>
<td>10 (10.0)</td>
<td>16 (16.0)</td>
<td>7 (7.0)</td>
</tr>
<tr>
<td>Vegetables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cabbage</td>
<td>10 (10.0)</td>
<td>12 (12.0)</td>
<td>9 (09.0)</td>
</tr>
<tr>
<td>Lettuse</td>
<td>11 (11.0)</td>
<td>7 (07.0)</td>
<td>5 (05.0)</td>
</tr>
<tr>
<td>Onion</td>
<td>6 (6.0)</td>
<td>8 (08.0)</td>
<td>2 (02.0)</td>
</tr>
<tr>
<td>Spinach</td>
<td>12 (12.0)</td>
<td>10 (10.0)</td>
<td>11 (11.0)</td>
</tr>
<tr>
<td>Total</td>
<td>800</td>
<td>94 (11.75)</td>
<td>77 (9.62)</td>
</tr>
</tbody>
</table>

DISCUSSION
Our results support those previous studies which found fruits and vegetables contaminated with geohelminths ova and larvae [9]; [10]; [18]; [19]; [20]. They concluded that the sources of fruits and vegetables were contaminated with faecal matter. Given the fact that the adult stage of worms encountered resides in the intestine is a vivid reflection of poor hygiene and sanitation of our rural areas (sources of these plants). The detection of helminth ova/
larvae on fruits and vegetables in the three study area, has a significant public health implication. Since some of the vegetables and fruits are processed and eaten uncooked which could lead to infection and disease especially when served to the public. Some of the fruits and vegetables are grown very close to the soil and prone to contamination, when eaten raw or uncooked. Soil contaminated as such may through rain splashing or flooding [1]; [21], cause geoehelminthes ova/larvae in faeces to be lifted above soil surface. Also, cyclorrhaphan flies attracted by such faeces-infested soil may carry ova/ larvae [22] and perch on plants. These processes could lead to their attachment on fruits and vegetables. The occurrence of A. lumbricoides(56.31%) than that of T. trichiura (30.85%), S. stercoralis and hookworm(23.37%) is consistent with the reports of [23] but disagrees with that of [24]. The high occurrence of A. lumbricoides may be attributed to high level of unhygienic practices among the communities which enhanced its occurrence. The presence of T. trichiura in the study area was not unexpected since it is known that similar conditions which influence the endemicity of A. lumbricoides also influence its endemicity [25]. It is also known that A. lumbricoides infections are rarely found alone in human communities [26]. The occurrence of intestinal helminth infections in the area was not unusual because the area is a rural area. Parasitic diseases are known to be common in rural areas because of poverty, ignorance and low sanitary conditions [27]. This study observed insignificant contamination rate between fruits and vegetable (p>0.05). This may probably be because they were grown in the same environment with manure-rich night soils. Also, due to very limited water resources in our rural areas, waters from shallow dug wells, streams and the rain harvested from thatched roof are used to irrigate these crops. Sources are not usually covered and some are pre-disposed to contamination by wastes including human/animal faeces with cysts, ova and or larvae [24]

**Recommendation**

Vegetable cannot be removed from human diet, but can be excluded from the cycle of transmission and dispersion of parasites. This can be achieved by mentainance of simple personal and environmental hygiene by sellers and consumers, avoid using untreated human and animal wastes as manure, soaking of vegetable for 10 minutes in vinegar or saturated salt solution which will plasmolize the parasites if present, cooking of vegetables adequately before serving them as meal, avoidance of indiscriminate defecation.

**CONCLUSION**

Conclusively fruits and vegetables consumed by people are quite often contaminated with parasites, more especially by intestinal parasites. This is an indication that humans are always at risk of infection especially as vegetables is naturally popular in the diet of people of all classes, [22]. These findings underscore the public health implication of vegetable farmers, sellers and consumers, being at high risk of infection with Strongyloidasis, Ascariasis, Amoebiasis and a host of others. The high prevalence of parasitic infection among the public has led to increased funding for epidemiological surveillance, unwarranted financial stress on patients, incidence of hospital admission, increase in the demand of antihelminthic drugs, pressure on pharmaceutical industry to discover and develop a more potent antihelminthic drugs to curtail increase spreading of parasites, the risks of death and finally food insecurity in West Africa. The campaign to eradicate parasitic infection must be intensified; this is the more reason world health organization has continued to call for global strategy in putting this menace under check [27].

**REFERENCES**


*http://www.journalzbr.com/issues.html*


