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Role of Vegetables in the Transmission of Intestinal Parasites in Khartoum Central Market, Khartoum State, Sudan

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Abstract:

This study was conducted at Khartoum central market to detect the parasitic contamination of vegetables sold for consumption. Microscopic examination of the samples was carried out using wet preparation and sedimentation technique. Total of 150 samples of vegetables were examined with five types of vegetables (watercress, onion, carrot, pepper and tomatoes). Among the 150 samples, 16 (10.6%) were positive for intestinal parasites. Among positive samples, onion and watercress were found to have the highest parasitic prevalence; onion positive samples were 8 (50%), watercress positive

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samples were 6 (37.5%), pepper positive samples were 2 (12.5%), no parasite were detected in both tomatoes and carrot. The parasite identified were Schistosma mansoni egg, Schistosma haematobium egg, Hook worm, Strongyloides stercoralis larvae, Taenia spp egg and Balantidium coli ciliate. The most prevalent parasite encountered was Strongyloides stercolaris larvae which was detected ten times constituting 62% out of 16 positive samples, followed by Schistosoma spp egg which was detected three times (19%), then comes Hook worm egg, Taenia spp egg and Balantidium coli ciliate which were detected one time with the percentage of 6% for each.

Key words: Vegetables, Transmission, Intestinal parasites, Khartoum Central Market.

INTRODUCTION:

Vegetables are essential for good health and they form a major component of human diet. They are vital energy contributors that are depended upon by all levels of human as food supplement or nutrients. They have high water content as seen in water leaf, lettuce and cabbage. Many vegetables and fruits are good sources of vitamin C, carotene and mineral elements such as iron [(1)]. Diets that include a sufficient amount of potassium from fruits and vegetables also help to reduce the chance of developing kidney stones and the effect of bone loss. Fruits are generally rich sources of fibers and carbohydrates. They are very healthy, whole to be enjoyed in moderation because some fruits are high in calories, carbs and glycomic index. An important nutritional value of fruits is its antioxidant contents; fruits such as orange, carrot; garden egg and tomato have the highest antioxidant value [(2)]. The nutritional content of vegetables varies considerably, generally they contain little protein and fat, dietary minerals, carbohydrate and varying proportion of vitamins such as vitamin A, vitamin K and

vitamin B6.Vegetables contain a great variety of other phytochemicals some of which have been claimed to have antioxidant, antibacterial, antiviral and arcinogenic properties [3]. The cultivation of vegetables and fruits for commercial and domestic purposes in Nigeria is mostly carried out by peasant farmers who depend on irrigation and/ or natural rainfall [4]. Since vegetables require a moist environment for growth, these conditions favor the development of transmissible form of entero-parasites such as cysts and eggs [5]. Vegetables and fruits particularly those eaten raw and without peeling can be agent of transmission of protozoa and helminthes [6]. The cultivation of vegetables in many parts of the word has been amplified with the application of fertilizer and or manure. In Africa, the transmission of intestinal parasitic infection has been considered to increase successfully due to the frequent use of untreated human or animal dung as manure in cultivation by the local farmers, which serves as a source of enhancement of zoonotic parasitic infection [4]. Consumption of raw or unhygienically prepared vegetables such as cabbage, lettuce, okra, garden egg, cucumber, carrot, waterleaf, pumpkin, spinach, tomatoes, etc, is considered to be a risk factor for human parasitic infections [7]. These 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 feces as manure, which are known to contain various species of parasites that are of medical and veterinary importance [8]. Indiscriminate fecal 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 is also polluted with parasites infected excreta that could lead to recycling of infection [9]. Increasing water scarcity in dry climate regions with agriculture based economy

forces people to use untreated wastewater for irrigation of crops. Practice of using untreated municipal waste water for irrigation, raw manure as fertilizer and habit of eating vegetables raw or undercooked are reported to result in risk of infection with intestinal parasites in developing countries [10]. Infection with vegetable-transmitted parasites and pathogenic bacteria can occur due to occupational exposure or through consumption of vegetables that are contaminated with human or animal excreta without proper washing and disinfection [11]. Unhygienic sewage disposal and absence of its treatment facilities pose potential health hazards through contaminating irrigated food crops with parasites in urban and suburban areas of African countries including Ethiopia [12]. Vegetables are reported to harbor intestinal parasites such as *Ascaris lumbricoides, Taenia spp, Fasciola hepatica, Hymenolepis nana, Echinococcus spp, Trichuris spp., Enterobius vermicularis, Trichostrongylus spp, Toxocara spp, Strongyloides stercoralis, Giardia lamblia, Entamoeba spp, Iodamoeba butschlii, Blastocystis hominis and Cryptosporidium parvum* [13]. The resistant nature of infective stages of the aforementioned parasites such as eggs, cysts or oocysts to adverse temperatures, desiccation, natural irradiation, chemicals and commonly used disinfectants results in high prevalence of vegetable-transmitted parasites in developing countries [11]. On the other hand, living under immunocompromised situation mainly due to HIV/AIDS exposes some percentage of the population across the world to opportunistic vegetable-transmitted parasites such as *Cryptosporidium spp*. [14]. Several studies documented prevalence of intestinal parasites in different parts of Ethiopia including Tigray region through microscopic examination of stool samples collected from suspected human population [15]. The main objectives of this study were to study the role of vegetables in the transmission of intestinal parasites in Khartoum central market, to detect

different parasitic species carried by those vegetables, to find out the most prevalent parasite in this market and to find out the most contaminated type of vegetable.

MATERIALS AND METHODS:

Study design:

This is a cross-sectional study.

Study area and study period:

The study was conducted in Khartoum central market state during the period from June to December 2015. Vegetable samples were collected from the central vegetable market in Khartoum town.

Study samples:

The vegetable used in this study were tomato, carrots, water cress, onion and pepper.

Sample size:

A total of 150 samples were collected, vegetables were picked randomly from the market to obtain qualitative estimation of parasitic contamination of these vegetables.

Sample processing:

Sample collection:

Samples were randomly collected from the market during 2 months in tow groups (group A and group B); each group includes 75 samples, group (A) prepared and examined before collecting group (B). Each sample was placed in a labeled plastic bag. The label contained the sample type and date of collection.

Procedure:

The samples were washed in 10% formal saline, each sample was soaked and washed in 30 ml of the washing saline which then was allowed to stand for 24 hours, then 15 ml of the sediment was centrifuged at 3000 rpm for 5 minutes using 15 ml falcon tubes, then the sediment was prepared for microscopical examination. The samples were examined under light microscope (10x and 40x) for parasite stages (oocyst, cyst, egg and larva), the parasitic stage was identified according to Soulsby [(16)].

Data analysis:

Data were analyzed using Statistical Package for the Social Sciences program (SPSS program). Frequencies and percentages tests were used and then the data were presented in tables and figures.

RESULTS:

Five different types of fresh unwashed, untreated vegetables were tested from major central Khartoum market. A total of 150 samples were tested for intestinal parasites microscopically, 16 (10.6%) of the 150 samples were positive for intestinal parasites. Among positive samples, onion and watercress were found to have the highest parasitic prevalence, onion positive samples were 8 (50%), watercress positive samples were 6 (37.5%), pepper positive samples were 2 (12.5%), no parasite were detected in both tomatoes and carrot in table (1) and in figure (1). The results showed that *S. stercoralis* was the most prevalent parasites as it was detected in 10 positive samples. *B. coli* was seen in only one case, *Schistosomes* were detected in 3 cases, *Taenia spp.* and *Hook worms* were detected in only one case. The results revealed that high mixed infection was observed with watercress (4 parasites)

followed by pepper (2parasites) in table (2) and in figures (2, 3, 4, 5, 6).

Table (1): Distribution of intestinal parasites among vegetables

Vegetable type	Group 1		Group 2		Total	
	Number of Examined	Number of Positives (%)	Number of Examined	Number of Positives (%)	Number of Examined	Number of Positives (%)
Tomatoes	15	0.0 %	15	0.0 %	30	0.0 %
Onion	15	46.6 %	15	6.6 %	30	26.6 %
Carrot	15	0.0 %	15	0.0 %	30	0.0 %
Pepper	15	13.3 %	15	0.0 %	30	6.6 %
Watercress	15	26.6 %	15	13.3 %	30	20.0 %
Total	75	17.3 %	75	4.0 %	150	10.6 %

Table (2): Distribution of intestinal parasites with relation to the type of vegetables

Vegetables	*B.coli*	*S.stercolaris*	*Schistosoma spp.*	*Taenia spp.*	*Hook worms*	Total
Tomatoes	0	0	0	0	0	0
Onion	0	8	0	0	0	8
Carrot	0	0	0	0	0	0
Pepper	1	0	1	0	0	2
Watercress	0	2	2	1	1	6
Total	1	10	3	1	1	16

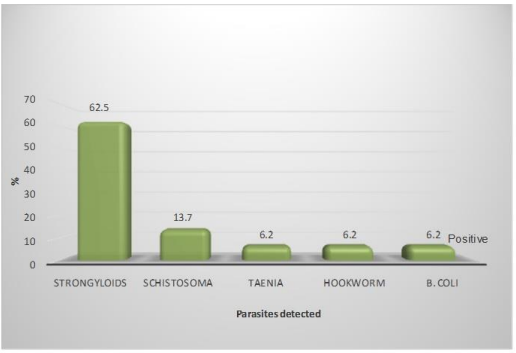

Figure (1): Distribution of intestinal parasites among positive samples

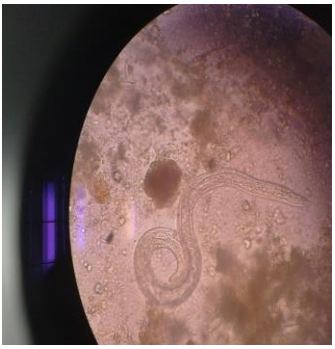

Figure (2): *S.srercolaris* larvae

Figure (3): *Schistosoma heamatobium* egg

Figure (4): *Schistosoma mansoni* egg

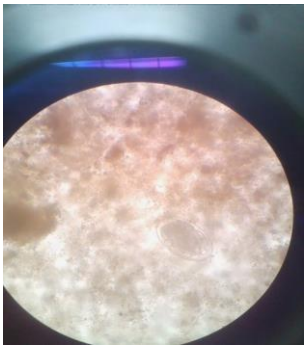

Figure (5): Hook worm egg

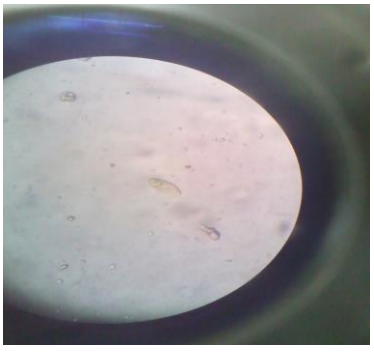

Figure (6): *B.coli* trophozoite

DISCUSSION:

The present study investigated 5 of the most daily vegetables used for human consumption in Sudan, in which several types

of parasites were detected, indicating that the consumption of raw vegetables play an important role in the transmission of parasites. Transmission of parasitic diseases through food was shown to be a serious problem which needs a further highlight by scientists and health care authorities, as food becomes a potential source of human infections. It was noticed that a number of reported cases of food borne illness related to vegetables consumption has increased [17]. It has been proved that poorly washed vegetables are considered to be a major way for transmission of parasitic infections [18]. Pre harvest fecal contamination may occur due polluted water from irrigation water canal, this is supported by the findings of our study, as *S. haematobium* eggs were isolated indicating water pollution. Soil seems to be a very important source of contamination as in this study a number of nematode larvae were detected from leafy vegetables. This may be because leafy plants grow inside or near the soil which exposes it to contamination especially fecal contamination, those nematodes may be animal or human parasites, with variation in size and shape. Some larvae have nematode features (rhabditifoid eosaphagus), but it was too small or too long to be defined as *S. stercolaris* or hook worm larvae. So another type of none nematodes larvae was detected, especially on leafy vegetables. *S.stercolaris* larvae were the most frequent parasite isolated in this study indicating soil pollution. It was detected in rhabditiform and filariform shape, reflecting fecal pollution of the soil, also it is known that *S. stercolaris* can undergo a free living existence, because of that and because it is able to withstand a wide variety of adverse environmental conditions it may be an annoying health problem specially to the farmers who obviously seem to be exposed to larval skin penetration. Also the presence of *Taenia* eggs shows the role of raised cattle in transmission of parasites such as *T. saginata* (transmitted by cows) and *T. solium* (transmitted by pigs). Also the use of organic fertilizers may

serve as an effective way of transmission, fecal matter may contain parasitic organisms, it was indicated by this study as *S. manson*i ova, *Hook worm* ova and *B. coli* ciliate were detected. Finally the presence of soil transmitted helminthes is a good indicator of a poor socio-economic condition as well as poor environmental and sanitation practice. Also reporting of parasitic stages from vegetables may be helpful in indicating the prevalence of intestinal parasites among a given population. Several surveys that have been conducted from different parts of the world showed that the vegetables can be effective agents for transmission of protozoa and helminthes [(19)]. Compared with a previous study, our study showed a difference in prevalence rates, probably due to geographical and socio-economic differences, type and number of samples tested, methods used for detection, type of water used in irrigation and post harvesting handling methods of such vegetables and even the type of water used to clean vegetables like the use of sewage water for irrigation which plays an important role in the epidemiology of transmission of the parasitic diseases [(20)]. As revealed in our study, one sample may contain more than one parasitic species, this indicate and reflects the poly fecal contamination of vegetables which may result in multiple parasitic infection. Also the study results highlighted the high rate of parasitic contamination of onion 8 (50%) and watercress 6 (37.5%) compared to the other tested vegetable types. This might probably reflect the excess use of onion and watercress in our food. The highest parasitic prevalence was *S. stercolaris* (62.5%) and *Schistosoma spp.* (18.75%). In this study, it was observed that the degree of contamination vary according to the type of vegetables, this may be due to that, watercress, onion, pepper, carrot and tomatoes have unequal surface on which parasites may attach more easily on one type of vegetables than another and also due to different conditions of growing and environment exposure.

CONCLUSION:

This study concluded the fact that fresh vegetables play an important role in human parasitic disease transmission, and that daily sold vegetables represents source of parasitic contamination if not treated and washed. It has been shown in this study that fresh vegetables represents a source of parasitic contamination and concluded that the possible reasons for this contamination are: irrigation water, organic fertilizers, domestic animals and poor hygienic conditions.

REFERENCES:

1. Duckworth, R. B. Farming system for production of fruits and vegetables. *Fruits and vegetables*, Pergama press, Oxford, USA. 1996.
2. Halvosen B. Myhrstad M. Barikmo I. Hvattum E. Remberg S. Wold A. Haffnern K. Baugerod H. Andersen L. Moskaug J. Jacobs D. and Blohoff R. Asystematic screening of total antioxidants in dietary plants. *Journal of Nutrition*. 2002.
3. Gruda, N. Impact of Environmental Factors on product Quality of Greenhouse vegetables for fresh consumption. 2005.
4. Lucas S., Ajugi I. and Umuh J. Helminthosis among primary school children. *Journal of Parasitology*. 2000
5. Oliveira A. and Germano M. Presence of intestinal parasites in vegetables sold in the metropolitan region of Sao Paulo, Brazil. Search of Helminthes. *Rev. saudepublica*. 1992; **26**:283-289.
6. Porter, J. D., Gaffney, C., Heymann, D. and Parkin, W. Food-borne outbreak of *Giardia lamblia*. Am. J. Publ. Health. 1990.
7. Cheesbrough, M. Medical Parasitology. Medical laboratory manual for tropical countries. 1991; **1**:163-411.

8. Okorokwo, M. O. Intestinal parasites associated with human and animal waste stabilization in Jos and Barkin Ladi areas of Plateau State, University of Jos, Nigeria. 1998.
9. Ayer, R. M. Waste water Reuse in agriculture and risk of nematode infection. *Parasitology today*. 1992; **8** (11): 32-35.
10. Blumenthal, U. J., Peasey, A., Ruiz-Palacios, G. and Mara, D. D. Guidelines for wastewater reuse in agriculture and aquaculture: recommended revisions based on new research evidence. Well Resource Centre, London School of Hygiene and Tropical Medicine and WEDC, Loughborough University, UK. 2000.
11. Beuchat, LR. Surface decontamination of fruits and vegetables eaten raw. A review World Health Organization, Food Safety Unit WHO/FSF/FOS/98.2. 1998.
12. Srikanth, R. and Naik, D. Prevalence of Giardiasis due to waste water reuse for agriculture in the suburbs of Asmara City, Eritrea. *International Journal of Environmental Health Research*. 2004.
13. Gharavi, M. J., Jahani, M. R. and Rokni, M. B. Parasitic contamination of vegetables from farms and market in Tehran. *Iranian J. Publ. Health*. 2002; **31**(3):83-86.
14. Esrey, S. A., Gough, J., Rapoport, D., Sawyer, R., Simpson-Hebert, M., Vargas, J. and Winblad, U. Ecological Sanitation, Sida Swedish International Development Cooperation Agency, Stockholm. 1998.
15. Legesse, M. and Erko, B. Prevalence of intestinal parasites among schoolchildren in a rural area close to the southeast of Lake Langano, Ethiopia. *The Ethiopian Journal of Health Development*. 2004; **18**, 116-120.
16. Soulsby. Helminthes, Arthropods and protozoa of domesticated animals. 7thedition. London, Bailliere Tindall. 1982.

17. Kang, G., Mathew, M. S., Rajan, D. P., Daniel J. D., Mathan, M. M., Mathan, V. I and Muliyil, J. P. Prevalence of intestinal parasites in rural southern Indian. 1998; **3**:70-75.
18. Shahnazi, M. and Jafar-Sabet, M. Prevalence of parasitic contamination of raw vegetables in village of Qazvin Province, Iran. *Food borne Pathogen Dis*. 2010; **7**(9):1025-1030.
19. Idahosa, O. T. Parasitic contamination of Fresh vegetables Sold in Jos Markets, *Global Journal of Medical Research*. 2011; **11**(1):21-25.
20. Gupta, N. and Khan, D. K. Prevalence of intestinal helminthes eggs on vegetables grown on waste water irrigated area. *Food control*. 2009; **30**:942-945.