

Parasitic Contamination of Raw Vegetables in Shahroud, Semnan

Saeid Nazemi,¹ Mehdi Raei,^{*2} Mohammad Amiri,³ Reza Chaman⁴

1. Department of Environmental Health Engineering, Faculty of Medicine, Shahroud University of Medical Sciences, Shahroud, Iran
2. Department of Biostatistics, Faculty of Medicine, Qom University of Medical Sciences, Qom, Iran
3. Department of Health Services Management, Faculty of Public Health, Shahroud University of Medical Sciences, Shahroud, Iran
4. Department of Epidemiology, Faculty of Medicine, Shahroud University of Medical Sciences, Shahroud, Iran

Article information	Abstract
<p>Article history: Received: 8 Nov 2011 Accepted: 7 Dec 2011 Available online: 20 Jan 2012</p>	<p>Background: Given the importance of healthy vegetables, the present study was conducted to determine parasitic infection of vegetable consumed in Shahroud.</p> <p>Materials and Methods: This cross-sectional study has been conducted on 92 samples of various vegetables collected from 16 vegetable growing farms and 1 vegetable process workshop.</p> <p>Results: Sixty two percent of tested vegetables lacked parasites and the highest amount of parasites observed (34.78%) was related to <i>Giardia lamblia</i>. A significant relationship was observed between parasite and having toilets in the farms as well as the extent of farms.</p> <p>Conclusion: safety of fertilizers consumed by farms and healthy fruits can have an effective role in reducing the parasitic infections.</p>
<p>Keywords: Vegetables Shahroud Contamination</p>	
<p>*Corresponding author at: Department of Biostatistics, Faculty of Medicine, Qom University of Medical Sciences, Qom, Iran. E-mail: mehdi_r_d@yahoo.com</p>	
Copyright © 2012 Zahedan University of Medical Sciences. All rights reserved.	

Introduction

Vegetables are very useful herbs that are essentially involved in providing nutrients, vitamins and minerals, protein and fibers for human body the consumption of which prevents from various diseases and have a special place in Iranian food culture [1].

On the other hand, these vegetables can cause the spread of infectious and parasitic diseases [2, 3] and are of the most important factors for human infection with parasites [4]; especially those that are consumed raw. That is consumed raw. Economic and social conditions, irrigation methods, use of human and animal manure in agriculture, educational level and individual and public awareness are of factors affecting the spread of human parasites [5].

Parasitic diseases can be considered among the most common diseases on the earth which are transmitted to humans through water, soil and foodstuffs such as vegetables.

Due to the lack of accurate surveillance systems, it is not possible to accurately estimate the economic losses caused by food-borne parasitic disease throughout the world. These losses include the cost of treatment and prevention from these diseases in animal and human sections, economic losses due to the disease and mortality, capture of infected carcasses and reduction of animal products [6].

Vegetables may get infected by bacteria, viruses, and pathogenic parasites from the time of planting to the consumption time [7]. The use of wastewater for irrigation, domestic and wild animal traffic, stool excretion as fertilizer or fresh stool and infections during

the planting, planting and harvesting and distribution are of the most important sources of vegetable infection. In many parts of the world, human or animal manure is used to nourish soil [8]. The use of wastewater in irrigation of vegetables has been reported to be one of major causes of parasitic infection of vegetable [5]. Determination of infection of these products and how to disinfect them have been considered by researchers.

The results of studies showed that the parasitic infection of vegetables is 20% in Kermanshah, 56.6% in Arak, 21% in Jiroft, 23.6% in Ahvaz, 12.5% in Bushehr, 55.9% in farms around Tehran, 2.2% in Pakdasht, 41.3% in Tehran, 29.6% in Kerman, 53.62% in Sabzevar, and 13.76% in Isfahan [2, 5, 8-10]. In another research, ascaris eggs and *Giardia lamblia* cysts are observed in collected vegetables [1].

In the study conducted in northern Nigeria, prevalence of parasitic infections in vegetables varies from 3.5 to 68.8% in various regions and the prevalence of ascaris eggs has been reported to be 0.5% [7]. In a study conducted in Saudi Arabia, the prevalence of ascaris has been reported to be 16% [11].

There is no detailed study with a clear picture of the spread of parasitic diseases in Shahroud, and most studies have been conducted on human feces. Therefore, the identification of parasitic infection transmitted by vegetables in each region can help custodians of health issues to control these diseases. Thus, this study was conducted to determine the parasitic infection of vegetables in Shahroud.

Materials and Methods

This research is an applied (cross-sectional) study conducted from August to October 2011 in Shahroud on 92 types of vegetables planted in the East Shahroud including leek, chamomile, coriander, savory, parsley, watercress, basil, radishes, scallion, tarragon and mint from 16 vegetable fields and a vegetable process workshop. It should be noted that except for radish and scallion, sampling from the rest of the vegetables is conducted from stem and leaf. All vegetable gardens of city constitute the study population and sampling was conducted randomly from the beginning, middle and end of each field. Each vegetable sample weighted one kilogram and totally, from each type of vegetable, a sample was taken from each farm. Samples were separately put inside nylon and were transferred to the laboratory to be washed and tested. These samples were tested through sediment concentration method, which is the standard method proposed by FDA (Food and Drug Administration of United States of America). Samples of one kilogram were divided into 5 parts of 200 g. Then, 200-gram samples were stirred in a bucket containing 1 liter of detergent solution (1% sodium dodecyl sulfate, 0.1% Tween 80) for 10 minutes. Then, the water from washing vegetables was collected in the polypropylene beakers and the contents of each beaker were transferred to centrifuge tubes and centrifuged for 10 min at 3000 rpm. Outer part of centrifuge tube was evacuated. Then, pipe sediments were merged through twice water washing of each tube. The final sediment was fixed with formaldehyde 4% for 10 minutes. One-to-two drops of Lugol solution were added to each tube for staining, and providing multiple expansions; parasites were studied under a microscope with magnification of 10 and then 40. Then, average of various parasites observed in centrifuge tubes was recorded [12]. The tools used were data collection form including seven general questions and 10 specific questions regarding the types of vegetables and parasites. After collection, data was entered into the software SPSS-16 and descriptive statistics were performed with their number and percentage and analysis through χ^2 statistical test. Significant level in this study is considered 0.05.

Results

In 92 vegetable samples collected from 16 vegetable farms, most tested vegetables were leek (17.4%) and then coriander and basil, each with frequency of 16/3%. The parasite observed in 75% of vegetable sampled from farms. All of farms used well water to irrigate crops and in more than 50% of gardens animal and chemical manures in the were used as combined to enrich soil. 56.2% of gardens lacked fences and 81.2% had no toilets or sanitary toilets. Most gardens (68.8%) had an area of over 1,000 square meters. 62% (57 samples) of tested vegetables were parasite-free. Among 46 parasite samples observed, most parasites were related to Giardia with

34.78% and then *Entameba coli* with 21.73% (Table 1). 45.7% (16 samples) of vegetables used for their enrichment from animal manure had parasite. 46.3% (19 samples) of vegetables prepared from fenced gardens had parasites. 88.2% (15 samples) of garden vegetables had sanitary toilets, no parasites, and 86.7% (33 samples) of vegetables of gardens which had neither toilet nor unsanitary toilets, had parasites.

There was no statistically significant relationship between consuming fertilizer and the presence of parasites ($p=0.27$) and between having fence and parasite ($p=0.19$). However, a significant relationship was observed between parasites in vegetables and existence of toilets in the gardens ($p=0.03$) and largeness of vegetable garden ($p=0.02$), so that vegetable gardens with sanitary toilets had less parasites than gardens with no toilet. Also, the number of parasites will increase with increase of largeness of gardens (Table 2).

The results also showed no significant correlation between the type of vegetable and existence of parasites ($p=0.1$). However, a significant relationship were observed between the type of vegetable and the type of parasite ($p=0.02$).

Discussion

In this study, 38% of vegetables had parasite. In his study, Malakootian has reported parasite infection of vegetables in the city of Kerman to be 29.6% and Izadi has reported it to be 13.76% in Isfahan farms which is less than recent results [2,5]. Also, in a study in Tehran province, infection percentage of vegetables with human parasites has been reported 2.2% [10]. In another study in Tehran province, the Salmonella infection of vegetables has been reported 28% and in another study conducted in the same province in 2004, infection percentage of vegetables has been reported 41.3% [4,8]. In a study entitled as comparison of the of infection of consuming vegetables before and after the washing, sterilizing and packaging in vegetable process workshop of Sabzevar, Bahadori has reported the infection percentage to be 53.62% that is higher than results of this study [9].

Results showed that the highest infection was related to watercress, basil and chamomile. In his study, Bahadori reported the greatest infection in leek and Homayooni in his study, reported lettuce and radishes as the most infected vegetables which are inconsistent with recent results.

The highest amount of parasites was related to Giardia and then *Entameba coli*. In his study, Homayooni reported the greatest infection to be related to Giardia, which is consistent with recent results. Bahadori and Izadi and Beliani has reported it ascaris eggs, Malakootian hymenolepis egg and Mehrabian reported it salmonella which are inconsistent with the present results [2, 4, 5, 9, 10]. The study of Adamu, tinea eggs were observed only in lettuce and in the present study, taenia echinococcus eggs were observed in vegetables of chamomile, coriander, watercress, basil, parsley and radishes [7].

Table 1. Frequencies depending on the type of vegetable parasites

Vegetables Parasites	Leek	Chamomile	Coriander	Herb king	Basil	Savory	Parsley	Mint	Radish	Tarragon	Chive	Total
No parasites	11	3	12	5	9	0	7	1	8	0	1	57
Antamoba coli	4	0	0	2	2	0	2	0	0	0	0	10
Giardia lamblia	0	5	1	3	3	1	1	2	0	0	0	16
Taenia/Echinococcus	0	1	1	1	1	0	2	0	1	0	0	7
Ascaris	0	1	0	2	1	0	0	1	0	0	0	5
Hookworm	0	0	0	0	0	0	0	1	0	1	0	2
Balantidium coli	0	0	1	0	0	0	0	1	0	0	0	2
Fasciola hepatica	0	0	1	0	0	1	0	1	0	0	0	3
E. histolytica	1	0	0	0	0	0	0	0	0	0	0	1
Total	16	10	16	13	16	2	12	7	9	1	1	103

Table 2. Association between parasite with fertilizer, fencing, toilets and extent

Variables		Number (%)	P-value
Fertilizer consumption	Animal	6(37.7)	0.27
	Chemical- Animal	10(62.5)	
Fence	Presence	7(43.8)	0.19
	Absence	9(56.2)	
Toilet	Presence	3(18.8)	0.03
	Absence	5(31.2)	
	No toilet	8(50)	
Extent	500-1000 m	5(31.2)	0.02
	≥1000 m	11(68.8)	

Taenia echinococcus is the cause of hydatid cyst disease in humans and animals [13,14]. Coming and going animals across the vegetable farms help to spread this disease and farm fencing can be effective in reducing the presence of parasite eggs in vegetables. However, the fertilizer used in farms is accumulated so that it would lack parasites (long-term accumulation, such as compost). In addition, construction of sanitary toilets in vegetable gardens and

fencing gardens and most importantly making vegetables healthy can be crucial in reducing parasitic infections and eventually, reduction of diseases transmitted to humans.

Acknowledgements

This paper is the result of the proposal No. 9029 approved by Shahroud University of Medical Sciences. The authors of this paper acknowledge their gratitude to Shahroud University of Medical Sciences for its cooperation and financial support as well as colleagues Ms. Piraste Nowruzi and Fatemeh Davardoost.

Authors' Contributions

All authors had equal role in design, work, statistical analysis and manuscript writing.

Conflict of Interest

The authors declare no conflict of interest.

Funding/Support

Shahroud University of Medical Sciences.

References

1. Abougrain AK, Nahasi MH, Madi NS, et al. Parasitological contamination in salad vegetables in Tripoli-Libya. Food Control 2010; 21: 760-762.
2. Izadi SH, Abedi S, Ahmadian S and Mahmoodi M. Study of the current parasitic contamination of the edible vegetables in Isfahan in order to identify preventive measures. Sci J Kurdistan Univ Med Sci 2006; 11(2): 51-58.
3. Correa CM, Tibana A, Gontijo Filho PP. Vegetables as a source of infection with Pseudomonas aeruginosa in a University and Oncology Hospital of Rio de Janeiro. J Hosp Infect 1991; 18(4): 301-306.
4. Mehrabian S, Tehrani S, Shahhosseiny MH and Pourbabaee AA. Salmonella prevalence in vegetables and determination of antimicrobial resistance patterns in Tehran. J Microbiol Knowledge 2009; 1(4): 51-57.
5. Malakoutian M, Hosseini M, Bahrami H. Parasitic contamination of consuming vegetables in Kerman City Iran. Hormozgan Med J 2009; 13(1): 55-62.
6. Falah M, Matini M, Beygomkia E and Moubedi I. Study of zoonotic tissue parasites (Hydatid Cyst, Fasciola, Dicrocoelium and Sarcocystis) in Hamadan Abattoir. Sci J Hamadan Univ of Med Sci 2010; 17(3(57)): 5-12.
7. Adamu NB, Adamu JY, Mohammed D. Prevalence of helminth parasites found on vegetables sold in Maiduguri, Northeastern Nigeria. Food Control 2012; 25: 23-26.
8. Homayouni MM, Khalagi N. Parasitic infestation of consumed vegetables in Tehran in 1383. J Army Univ Med Sci 2007; 4(4):1053-1056.
9. Ranjbar-Bahadori S, Estiri HR, Kashefinejad M. Comparing the vegetable infection before and after washing, disinfecting and packaging vegetable processing farms in Sabzevar, Iran. J Sabzevar Univ Med Sci 2010; 16(4(54)): 234-239.
10. Beliani S, Saeedi-Asl MR. Parasitic contamination of vegetables in Tehran province. J Food Technol Nutr 2009; 1(1): 15-24.
11. Al-Binali AM, Bello CS, El-Shewy K and Abdulla SE. The prevalence of parasites in commonly used leafy vegetables in South Western Saudi Arabia. Saudi Med J 2006; 27: 613-616.
12. Bier JW. Isolation of parasites on fruits and vegetables. Southeast Asian J Trop Med Public Health 1991; 22: 144-145.
13. Tijani AO, Musa HI, Atsanda NN and Mamman B. Prevalence of hydatidosis in sheep and goats slaughtered at Damaturu Abattoir, Yobe State, Nigeria. Nigerian Veterinary J 2010; 31: 71-75.
14. Abdullahi AM, Oboegbulem SI, Daneji AI, et al. Incidence of Hydatid cyst disease in food animals slaughtered at Sokoto Central Abattoir, Sokoto State, Nigeria. Veterinary World 2011; 4(5): 197-200.

Please cite this article as: Nazemi S, Raei M, Amiri M, Chaman R. Parasitic contamination of raw vegetables in Shahroud, Semnan. Zahedan J Res Med Sci (ZJRMS) 2012; 14(8): 84-86.