American Journal of Science and Learning for Development

Volume 1 | No 1 | Nov-2022

Examination of Parasitic Contamination of Fresh Vegetables Sold in Different Markets in Wukari Metropolis

Nehemiah Morris

Department of Physical and Life Sciences, Kwararafa University Wukari

***Abstract*:** *A study of parasitic contamination on fresh vegetables sold in different markets in Wukari metropolis of Wukari L.G.A, Taraba State, Nigeria was conducted between the months of February-March, 2017. Samples collected were prepared using zinc sulphate floatation techniques and examined microscopically for the prevalence of helminthes eggs and larvae and protozoa cysts. In this study, overall positive samples were 88 out of 136 fresh vegetable samples examined. Also, the distribution of medically importance parasites in contaminated fresh vegetables in different markets were calculated using Chi-square and the significant difference at (P>0.01) were recorded. Spring onion and tomato were found significantly low in old market and Haske market while tomato only in new market and spring onion only in Yam market. New market (25) had the highest prevalence of 20.8% parasite ova and cyst, while Old market and Haske market had 20 (16.7%) and Yam market had the least 17 (14.2%).Spinach and Sorrel had the highest rate of parasitic contamination of (83.3%) than Tomato (53.3%) and Spring Onion (46.7%). Also, a total of twelve different species of medically important parasites are detected, these included Ascaris lumbricoides (24.8%), Strongyloides stercoralis (21.1%) (p>0.05), Enterobius vermicularis (11.7%), Trichuris trichiura (8.8%), Taenia saginata (8.8), Hookworm eggs (5.8%), Giardia lamblia cysts (4.4%), Hymenolepis nana (3.6%), Balantidium coli (2.9%), Dipylidium caninum egg packets (2.9%), Hymenolepis diminuta (2.9%), and Entamoeba histolytica (2.2%). Fresh vegetables washed with dirty water (well water) had (37.5%). While, one washed with clean water (borehole water) shows no parasite ova and cyst (0.0%).*

Keywords: *Vegetable, parasites, contamination, Wukari metropolis.*

Introduction

Vegetable refers to any part of plant (herbaceous plants roots, stems, leaves) that is consumed by humans as food, as part of a savory meal. Vegetables can be eaten either raw or cooked and play an important role in human nutrition, being mostly low in fat and carbohydrates, but high in vitamins and minerals (Oguntibeju, *et al*., 2013; Mohammed, *et al*, 2016).Vegetables are rich source of dietary fibre, folate (folic acid), potassium, vitamin A,B,C,E and K, magnesium, iron, and calcium. Dietary fiber from vegetables, for instance, reduces blood cholesterol levels and lowers risk of heart diseases and obesity. It ensures proper bowel function and protects the bowel from protracted constipation, hemorrhoids, colon cancer and diverticulosis (Rubatzky and Yamaguchi, 1997; Mohammed, *et al*, 2016).

Fresh vegetables can be agents of transmission of protozoan cysts and helminthes egg and larvae. In developing countries, intestinal parasitic diseases are still a public health problem, probably due to poor sanitation and inadequate personal hygiene (Kang, 1998; Steketee, 2003; Simon-Oke, *et al*., 2014; Asadpour, *et al*., 2016).

The consumption of raw(fresh) vegetables which are contaminated by wastewater during irrigation, application of fertilizers, and marketing represent important route in the transmission of parasitic infection(Asadpour *et al*., 2016). Several surveys have been done in different part of the world which indicated that, vegetables can be a major source for transmitting protozoan cysts (*Entamoeba histolytica; Giardia lamblia; Entamoeba coli; Balantidium coli), Oocysts (Isospora belli; cryptosporidium spp*.), and helminthes egg and larvae(*Strongyloides stercoralis; Trichuris trichiura; Enterobius vermicularis; Fasciola hepatica; Ascaris lumbricoides; Toxocara spp.; Hymenolepsis nana; Hymenolepsis diminuta, Taenia spp*.). Parasitic infections lead to about 300 million severe illnesses with approximately 200,000 deaths occurring in developing countries (Mohammed, *et al.*, 2016).

Parasites are living organisms which take its nourishment and other needs from a host. They Parasite can be Ecto or Endo (Assafa,*et al*., 2004). But special emphases are on endoparasites (inside host) which are ingested through contaminated fresh vegetables.

All of these have urged the undertaking of this study to investigate the level of parasitic contamination of fresh vegetables sold in different markets in Wukari Town.

MATERIALS AND METHOD

Study Area

This study was conducted in Wukari metropolis of Wukari Local Government Area of Taraba state. The town is situated in longitude 9^0 47'E and latitude 7^0 51'N on the southern part of the State about 206km away from Jalingo the State capital. The study was done during dry season between February-March. A total of 128 fresh vegetable samples were collected. Eight (8) vegetable of each species were collected from each Market in Wukari Town.

The vegetables comprises of:

- Sorrel (Common Name); *Hibiscus aspar (*Botanical Name); Yakuwa (Hausa Name) and Awuri (Jukun Name).
- Spring Onion (Common Name); *Allium cepa* (Botanical Name) and Albasa (Hausa Name).
- Tomato (Common Name); *Salanum lycopersicum*(Botanical Name); and Tumatur(Hausa Name).
- Spinach (Common Name); *Amaranthus histilis* (Botanical Name); Alayyahu (Hausa Name) and Abiyo (Jukun Name).

Sample Collection, Preparation and Washing

The fresh vegetable samples for this examination (survey) were collected randomly from the four mention markets. Each sample from each market is collected twice in a week. Vegetables were sample early in the morning. A well labeled sample (polythene) bags were used for the transportation of each sample to the Laboratory for analysis. zinc sulphate floatation techniques were used in concentrating the cyst and ova of the parasites (Neva and Brown 1983; Cheasebrough, 2003; Simon-Oke, *et al*., 2014).

Procedures for Samples Preparation and Washing

A portion (150g) of each fresh vegetable samples were weighed and washed with distilled water in 250ml conical flask for detaching the parasites. The washing were sieved into another clean 250ml conical flask to remove debris and then dispensed in to clean three 15ml test tubes and centrifuge at 2500rpm for1minutes and supernatant were decanted carefully. 2ml of the deposit (sediment) were placed in a 15ml test tube which was filled with the zinc sulphate solution to the brim and covered with clean glass slide. Also 16 out of the washed samples were re-washed with borehole and well water.

Examination of Samples

Macro Examination

The samples were carefully examined for the presence of macro parasite such as segment of cestodes (tapeworms) and adult Nematodes.

Micro Examination

In micro examination, the clean glass slides placed at the top of 15ml test tube were removed after 30minutes. Cover slips were placed gently to avoid air bubbles and were examined under Binocular microscope using multiple objectives lens x10, x40 andx100. The various helminthes egg, larvae and protozoa cyst were detected. Three slides were prepared from each sample to increase the chance of parasitic detection. Also a single drop of lugols iodine solution was added prior to the prepared slide to stain the parasites ova, larvae, and cyst for more and easy identification. The eggs, larvae, and cyst were identified base on morphological details as described by Rai, *et al.,* 1996; WHO, 2004; Muna, 2004.

Data Analysis

Data analysis was done using tables and percentages. The Chi-square test was used to find out the prevalence of medically importance parasites in relation to fresh vegetables.

Results

Table 1. Distribution of Medically Importance Parasites Ova and Cyst in Fresh Vegetables Sold at Old Market in Wukari Metropolis

Vegetable type	Examined	No. of positive	Prevalence (%)
Spinach	30	7	23.3
Sorrel	30	5	16.7
Spring onion	30	4*	13.3
Tomato	30	4*	13.3
Total	120	20	16.7

* Shows low significance difference ($p > 0.01$)

Table 2. Distribution of Medically Importance Parasites Ova and Cyst in Fresh Vegetables Sold at New Markets in Wukari Metropolis.

Vegetable type	Examined	No. of positive	Prevalence (%)
Spinach	30	6	20.0
Sorrel	30	7	23.3
Spring onion	30	7	23.3
Tomato	30	5*	16.7
Total	120	25	20.8

*Significant difference is lower ($P > 0.01$)

Table 3. Distribution of Medically Importance Parasites Ova and Cyst in Fresh Vegetables Sold at Yam Markets in Wukari Metropolis.

Vegetable type	Examined	No. of positive	Prevalence (%)
Spinach	30	5	16.7
Sorrel	30	6	20.0
Spring onion	30	2*	6.7
Tomato	30	4	13.3
Total	120	17	14.2

* Shows low significance difference ($p > 0.01$)

Table 4. Distribution of Medically Importance Parasites Ova and Cyst in Fresh Vegetables Sold at Haske Market in Wukari Metropolis.

Vegetable type	Examined	No. of positive	Prevalence (%)
Spinach	30	7	23.3
Sorrel	30	7	23.3
Spring onion	30	3*	10.0
Tomato	30	3*	10.0
Total	120	20	16.7

* Shows low significance difference ($p > 0.01$)

Table 5. Present of medically important parasites ova and cyst in fresh vegetables washed with well waters.

Vegetable type	Examined	Positive	Percentage (%)
Spinach	4	1	25.0
Sorrel	4	3	75.0
Spring onion	4	2	50.0
Tomato	4	0	0.0
Total	16	6	37.5

Table 6. Present of medically important parasites ova and cyst in fresh vegetables washed with borehole water.

Vegetables type	Examined	Positive	Percentage (%)
Spinach	4	0	0.0
Sorrel	4	0	0.0
Spring onion	4	0	0.0
Tomato	4	0	0.0
Total	16	0	0.0

Table 7. Fresh Vegetable with High Prevalence of Parasitic Contamination

Sampling markets	Spinach (%)	Sorrel (%)	Spring Onion (%)	Tomato (%)
Old Market	23.3	16.7	13.3	13.3
New market	20.0	23.3	16.7	16.7
Yam Market	16.7	20.0	6.7	13.3
Haske Market	23.3	23.3	10.0	10.0
Total	83.3	83.3	46.7	53.3

Table 8. Endoparasite That Are More Prevalence

Parasites ova, larvae and cyst	Number present	Percentage (%)
A. Lumbricoides ova	34	24.8
E. histolytica	3	2.2
G. lamlia cyst	6	4.4
H.nana egg	5	3.6
Hook worm egg	8	5.8
T.trichiura ova	12	8.8
S. stercoralis ova/larvae	29*	21.1
E. vermicularis ova	16	11.7
T. saginata egg	12	8.8
B. coli cyst	4	2.9
Dipylidium caninum egg	4	2.9
H. diminuta ova	4	2.9
Total	137	

*Significant difference is higher ($p > 0.05$)

Discussion

The result of the study shows that, the prevalence of parasitic contamination of fresh vegetables collected in the various markets was generally low as indicated (Table1-4) above. New market (Table 2.) has the highest prevalence of parasite ova and cyst with (20.8%). Followed by Old market (Table 3.) and Haske market (Table 4.) with the same proportion of (16.7%). Finally, Yam market (Table 5.) which recorded the least prevalence (14.2%) of the parasite. According to statistical analysis, there is significant difference in the contamination of fresh vegetables (P >0.01).In Old market and Haske market (Table 1and 4), spring onion and tomato are highly significance at (p > 0.01). In Yam market, spring onion only is significantly high at (p > 0.01). While, in New market (Table 2) only tomato shows high significance difference at (p > 0.01).The differences may be due to sanitation, or how the retails handled the fresh vegetables in the various markets.

The (Table 5) above shows that, a fresh vegetables washed with dirty water (well water) has parasite ova and cyst (37.5%). While Fresh vegetables washed with clean water (borehole water) shows no parasite, ova and cyst (0.0%) as indicated in (Table 6). The study has shown that, washing fresh vegetables with well water can only add more parasites but not reducing, because the water itself are contaminated with the ova and cyst of different parasites. Furthermore, this finding correspond with the study by Shahonazi and Jafari-Sabet, (2010) which point out that, the poorly washed vegetables are post-considered a major route for transmitting intestinal parasitic infections. That is to say, fresh vegetables need to be properly washed with clean water (borehole water) before eating.

In this study, 88 0ut of 136 vegetable samples examined are contaminated. Spinach (*Amaranthus histilis*) and Sorrel (*Hibiscus asparagus*) has the highest rate of parasitic contamination of (83.3%). While Tomatoes (*Solanum lycopersicum*) has (53.3%) and Spring Onion (*Allium cepa)* has the less contamination of (46.7%).

Helminthes egg and prozoans cysts were detect in 88 of 136 fresh vegetables examined during the study. The most detected endoparasites in the vegetables samples in all the four markets were *Ascaris lumbricoides* (24.8%), *Strongyloides stercoralis* (21.1%), *Enterobius vermicularis* (11.7%), *Trichuris trichiura* (8.8%), *Taenia saginata* (8.8), *Hookworms egg* (5.8%),*Giardia lamblia cyst* (4.4%), *Hemenolepsis nana* (3.6%), *Balantidium coli* (2.9%), *Dipylidium caninum egg packets* (2.9%), *Hemenolepsis diminuta* (2.9%), *and Entamoeba histolytica*(2.2%). However, statistical analysis reveals that, *Strongyloides stercoralis is significantly higher than the remaining parasites at (p > 0.05).*

Conclusion

The study shows a moderate rate of fresh vegetables contaminated with protozoan and helminthes in different markets in Wukari metropolis. New market recorded the highest prevalence of 25 (20.8%) contamination among the four markets studied, fresh vegetables washed with well water shows the presence of parasites 6 (37.5%) while the one washed with borehole water shows no parasites, Spinach(*Amaranthus histilis*) and Sorrel (*Hibiscusasparagus)* has the highest rate of parasitic contamination of (83.3%), also *Ascaris lumbricoides* is the more prevalence endoparasite 34 (24.8%).

References

1. Adrabbo, K. and Peura, D., (2002). Giardiasis*: A Review*. *Practical Gastroenterology*: 300-302.
2. Andoh, A.L.; Abaidoo, C.R.; Kondrasen, F. and Klank, T.L. (2009). Helminths Contamination of Lettuce and Associated Risk Factors at production sites, Markets and street food vendors point in urban and peri-urban Kumansi, Ghana. *Research Journal of Microbiology* 4:13-22
3. Asadpour, M.; Malekpour, H.; Jafari, A. and Bahrami, S. (2016). Diversity of parasitic contamination in raw vegetables commonly consumed in Shiraz, southwest of Iran. *Asian Pacific Journal of Tropical Disease* 6(2): 160-162

4. Assafa, D.; Kibru, E.; Nagesh, S.; Gebreselassie, S.; Derib, F. and Ali, J. (2006). Medical parasitology.*Ethiopia Public Health Training Initiative* (EPHTI): 12-122
5. Bagayan, M.; Zongo, D.; Ouéda, A.; Savadogo, B.; Sorgho, H.; Drabo, F.; Ouédraogo, A.; Bamba, I.; Zhang, Y.; Kabré, B.G. and Poda, N.J. (2015). Prevalence of *Hymenolepis nana* among primary school children in Burkina Faso.*International Journal of Medicine and Medical Sciences* 7(10): 148-153
6. Bauri, K.R.; Ranjan, R.; Deb, R.A. and Ranjan, R. (2012). Prevalence and sustainable control of *Balantidium coli* infection in pigs of Ranchi, Jahrkahnd, India.*Vet. World* 5(2): 94-99
7. Benti, G. and Gemechu, F. (2014). Parasitic Contamination on Vegetables Irrigated with Awash River in selected farms, Eastern Showa Ethiopia. *Journal of Parasitology and Vector Biology* 6(7): 103-109
8. Bethony, J.; Brooker, S. and Albonico, M. (2006). Soil-transmitted helminth infections.ascariasis, trichuriasis and hookworm. *Lancet* 367 (9521): 1521-1532
9. Biu, A.A. and Hena, A.S. (2008). Prevalence of human taeniasis in Maiduguri, Nigeria. *International journal of Biomedical and Health Sciences* 4(1): 25-27
10. Burkhart, C.N. and Burkhart, C.G., (2005). Assessment of frequency, transmission, and genitourinary complication of enterobiasis (pinworm). *International Journal of Dermatology* 44 (10): 40-837
11. Cabello, R.R.; Ruiz, C.A.; Romero, C.; Feregrino, R.R. and Zavala, T.J. (2011). Dipylidium caninum infection. *BMJ case Report*: 322-9318
12. Caldwell, J.P. (1982) Pinworms (*Enterobius vermicularis). Canadian Family Physician* 28: 306–309.
13. Chacon-cruz, E., (2009). Intestinal protozoa diseases. General hospital Tijuana, Mexico. Pp 23-28.
14. Chau, H.; Thong, H.; Chao, N.; Hung, P.; Hai, V.; An, L.; Fujieda, A.; cru, T. and Akamatsau, M.(2014). Microbial and Parasitic Contamination on Fresh Vegetables Sold in Traditional Markets in Hue city, Vietnam. *Journal of Food and Nutrition Research* 2(12): 959-964
15. Cheesbrough M. (2003). Medical Laboratory Manual for tropical Countries, 2nd edition, University press Cambridge: Pp. 200-357.
16. Cheesebrough, M. (2006). *District laboratory practice in tropical countries.*Parts I. Edinburgh, Cambridge University Press. London. Pp. 428
17. Cook, G.C. (1994) *Enterobius vermicularis infection. Gut* 35 (9): 1159–62.
18. Cook, G.C. and Zumla, A.I., (2009). Manson's tropical diseases.22nd ed. Saunders Elsevier. Pp. 1515-1519
19. Crompton, D. W. T. (1989). Biology of *Ascaris lumbricoides.*In. Crompton, D. W. T., Nesheim, M. C. and Pawlowski, Z. S. (eds.) *Ascariasis and its prevention and control* London,Taylor & Francis. Pp 9-44
20. Dada, B.J.O. (1980). Taenisis, Cysticercosis, and echinococcosis in Nigeria. *Journal of helminthology* 54(4): 281-286
21. Damen, J. G.; Banwat, E. B; Egah, D. Z. and Allanana, J.A. (2007). Parasitic Contamination of Vegetables in Jos, Nigeria. *Annals of African Medicine* 6: 115-118.
22. Davey, T.H. and Davey, T.W. (1971). Control of Diseases in the Tropics. A Handbook for Medical practitioners 4th ed. Bailliere Tindall, London: Pp. 57-65
23. Donkor, A-P.K. (2009). *Trichuris trichiura*. Department of emergency medicine. Olive view internal medicine. University of Califonia, Los Angeles medical center: 321-333

24. Donkor, K.M. D. (2016). Trichuris trichiura (Whipworm) infection (Trichuriasis). At emedicine.medscape.com/article/788570-overview
25. Eraky, A.M.; Rashed, M.S.; Nasr, E.M.; Salah El-hamshary, M.A. and El-Ghannan, S.A. (2014). Parasitic Contamination of Commonly Consumed Fresh Leafy Vegetables in Benha, Egypt. *Journal of Parasitology Research* 7: 613960
26. Farthing, M.J., (1996). Giardiasis.*Gastroenterol Clin North Am*. 25(3):493-515
27. Flanagan, P.A., (1992). Giardia--diagnosis, clinical course and epidemiology. A review. *Epidemiol Infect*. 109 (1):1-22.
28. Garcia, L.S., (2009). Practical guide to diagnostic Parasitology.*American Society for Microbiology*. Pp. 246–247.
29. Garedahi, Y.; Hashemzade, H.; Farhang and Pooryagoobi, S. (2011). Parasitic contamination of fresh vegetables consumed in Tabriz, Iran. *Research Journal of Biological Sciences* 6: 518-522
30. Ghaffar, A. (2001). "Cestodes" (online). At http://www.med.sc.edu:85/parasitology/cestodes.htm.
31. Giarratana, F.; Muscolina, D.; Taviano, G. and Ziino, G. (2012). *Balantidium coli* in pigs regularly slaughtered at Abattoirs of the province of Messina: Hygienic Observations. *Open Journal of Vertinary Medicine* 2:77-80
32. Grewal, M.S. (1968). *Balantidium coli. J. Ass.Physns. India* 16: 314-319
33. Grove, D. I. (2002). *Enterobius vermicularis*. In: Yu, V. L., Weber, R. and Raoult, D. (eds.) *Antimicrobial therapy and vaccines* New York, Apple Trees Productions, LLC. Pp 1641-1650.
34. Gutiérrez, Y., (2000). Diagnostic pathology of parasitic infections with clinical correlations.2nd ed. Oxford University Press. Pp. 354–366.
35. Gwartney, A. (2011). Egg of Hemenolepis diminuta. *American society of micrpbiology*: 1-20
36. Hill, D.R., (1993). Giardiasis. Issues in diagnosis and management. *Infect Dis Clin North Am*.7 (3):503-25.
37. Hotez, P.J., Bethony, J., Bottazzi, M.E., Brooker, S. and Buss, P., (2005). Hookworm: the great infectious of mankind. *PLoS Med.* 2 (3): 67.
38. Hotez, P.J., Brooker, S., Bethony, J., Bottazzi, M.E. and Loukas, A., (2004). Current concepts. Hookworm infection.*N Engl J Med.* 351: 799–807.
39. Huston, C.D., Haque, R. and Petri, W.A. Jr., (1999). Molecular-based diagnosis of *Entamoeba histolytica* infection. *Expert Rev Mol*. 1-11.
40. Idohosa, T.O. (2011). Parasitic Contamination of Fresh Vegetables Sold in Jos Markets. *Global Journal of Medical Research* 11(1): 21-25
41. John, D.T. and Petri, W.A., (2006). Markell and Voge's Medical Parasitology (9th ed.). Philadelphia: W. B. Saunders. p 49
42. Johnston, F.H.; Morris, P.S.; Speare, R.; McCarthy, J.; Currie, B.; Ewald, D.; Page, W. and Dempsey, K.; (2005). *Strongyloidiasis*: A review of the evidence for Australian practitioners. *Australian Journal of Rural Health*.13:247-254.
43. Joshi, S. (2016). Hymenolepis nana morphology and life cycle.*Biology discussion*: 31247
44. Kang, G, Matthew, D, Daniel, M, Mathan, V. and Muliyil, J. (1998). Prevalenceof Intestinal parasites in rural Southern India.*Trop. Med. Int. Health* 3: 70-75.
45. Liu, D. (2012). Dipylidium. Molecular Detection of Human Parasitic Pathogens. *New England Journal of Medicine*: 245-248
46. Longe, L.J. (2005). Gale encyclopedia of alternative medicine, 2nd edition. Detroit: Pp 22-2411

47. Londe, L.J. and Blanchfield, D. (2002). Gale encyclopedia of medicine.1nd edition. London:p 3966

48. Magalhaes-Soares, J.R.; Fançony, C.; Gamboa, D.; Langa, A.J; Sousa-Figueiredo J.C; Clements, A.C.A. and Nery, S.V. (2013). Extanding helminths control beyond STH and schistosomiaisis: The case of Human Hymenolepiasis. *Plos Negl. Trop. Dis*. 7(10).

49. Marangi, M.; Zchini, B.; Fileti, A.; Quaranta, G. and Aceti, A. (2003). Hemenolepis diminuta infection in a child living in the Urban Area of Rome, Italy.*Journal of Clinical Microbiology* 41(8): 3994-3995

50. Markell, E.K.; John, D. C. and Petri, W.H.; (2006). Markell and Voge's medical Parasitology . 9th ed. St. Louis, Mo: Elsevier Saunders. Pp. 216-479.

51. Mohammed, A.M.; Siddig, E.E.; Elaagip, H.A; Mohammed, M.A.E. and Nasr, A.A. (2006). Parasitic Contamination of Fresh Vegetables Sold at Central markets in Khartoum State, Sudan. *Annals of Clinical Microbiology and Antimicrobials* 15(17).

52. Muna, Y.H. (2004). Integrated Guide to Sanitary Parasitology. World Health Organization Regional Office for the Eastern Mediterranean Regional Centre for Environmental Health activities Amman-Jordan: p. 119

53. Neva and Brown. (1983). Basic Clinical Parasitology 5th edition Prentice-Hall International INC, California: 1-10.

54. Onyeodiri, E. O. (unpublished). Patterns of transmission, prevalence, and intensity of soil transmitted Helminthiasis in Nsuka Zone, Enugu State, Nigeria: Pp. 18-37

55. Pam, D.D; Pam, V.A; Bot, C.C., Adullateef, M.H. and Ogbu, K.I. (2015).Intensity of contamination of Vegetables in different Markets in Jos South Local Government Area of Plateau State. *Greener Journal of Agricultural Science* 5(6): 217-222.

56. Rai, K.S.; Uga, S.; Kataoka, N. and Matsutsumura, T. (1996). Atlas of medical parasitology. IRMed.ir. First edition. 7-5-I, Kusunoki-cho,chuo-ku, kobe 650, Japan. Pp. 12-34

57. Rao, C.K.; Biswas, H. and Gupta, S.R. (1975).*J. Com. Dis*. 7:1-14

58. Roberts, L.S. and Janovy, J. Jr. (2009). Foundations of Parasitology, 8th Edition.MA: McGraw-Hill. P 865

59. Roberts, L.S. and Jonovy, J.R. (2005). Foundations of Parasitology, Sixth Edition.MA: McGraw-Hill Higher Education. Pp. 412-415

60. Ryan, K. J. and Ray, C.G. (2004). Sherris Medical Microbiology: An Introduction to Infectious Disease. 4th Ed. New York: McGraw-Hill, Pp. 727-738.

61. Said, E. D. (2012). Detection of parasites in commonly consumed raw vegetables. *Alexandria journal of medicine* 48(4): 345-352

62. Saki, J.; Asadpoori, R. and Khademvatan, S. (2013). Prevalence of Intestinal Parasites in Vegetables Consumed in Ahvaz, South West of Iran. *Journal of Medical Sciences*, 13: 488-492

63. Schuster, L.F.; and Ramirez-Avila, L. (2008). Current World Status of *Balantidium coli. Clin Microbiol Rev* 21(4): 626-638

64. Segarra-Newnham, M. (2007). Manifestations, diagnosis, and treatment of *Strongyloides stercorali* infection. *Ann Pharmacother* 41(12):1992-2001.

65. Shahnazi, M. and Jafari-Sabet, M. (2010). Prevalence of parasitic Contamination of Raw Vegetables in Villages of Qazvin province, Iran. *Foodborne Pathog Dis.* 7(9): 1025-1030

66. Showkat, A. W., Fayaz, A., Showkat, A.Z., Zubair, A.D., Pervaiz, A.D. and Ayesha, A. (2010). Intestinal Helminthiasis in children of Gurez Valley of Jammu and Kashmir State, India. *America Society of Parasitologist*. 2(2): 91-94.

67. Simon-Oke, I.A; Afolabi, O.J. and Obasola, O.P. (2014). Parasitic Contamination of Fruit vegetables Sold at Akure Metropolis, Ondo State, Nigeria. *Researcher* 6(12): 30-35

68. Skeketee, R. (2003). Nutrition and Parasitic Diseases. *J.of Nutr.*: 133-1661.

69. Skerratt, L.F. (1995). *Strongyloides spearei* n. sp. (Nematoda: Strongyloididae) from the common wombat *Vombatus ursinus* (Marsupialia: Vombatidae). *Systematic Parasitology*32:81-89.

70. Speare,R., (1989). Identification of species of *strongyloides*. In: Grave D.I. (ed) *strongyloidiasis*: a major roundworm infection of man. Tyalor and Franscis: London. Pp. 11-83

71. Szwaja, B.; Romanski, L. and Zabczyk, M. (2011). A case of Dipylidium caninum infection in a child from the Southeastern Poland.*Polish parasitological society* 57(3): 175-178

72. Tasawar, Z.; Gul, S.; Bhutta, A.M and Arif, M. (2004).Prevalence of *Hymenolepis nana* in Human Beings in and Around Multan Pakistan. *Pakistan Journal of Life and Social Sciences*2(1): 62-64

73. Tefera, T.; Biruksew, A.; Mekonnen, Z.; and Eshetu, T. (2014). Parasitic Contamination of Fruits and Vegetables collected from Local Markets of Jimma Town, South west Ethopia. *International Scholarly Research Notices* 2014 (7):382715

74. Tettah, P. (unpublished). A comparative study of intestinal parasitic infection and associated risk factors among Primary School Children in six neighbouring communities in Kumasi, Ghana: Ayigya, Kentinkrono, Aboabo, Manhyia, Gyinyase and Kyirapatre: Pp. 23-74

75. Ukoli, F. M. A. (1990). *Introduction to parasitology in tropical Africa*.Ibadan, Text flow Limited.p 464

76. Voge, M. and Heyneman, D. (1957). Development of *Hymenolepis nana* and *Hymenolepis nana*. *University of Califonia Publications in Zoology* 59: 549-580

77. WHO (2004). Sanitary Parasitology. Regional Centre for Environmental Health Activities: p 119

78. Wolfe, M.S., (1992). Giardiasis.*Clin Microbiol Rev*. 5(1): 93-100.

79. Rubatzky, V.E. and Yamaguchi, M. (1997). Importance of Vegetables in Human Nutrition. In World Vegetables, Springer Boston. Pp. 34-41

80. Oguntibeju, O.O.; Truter, E.J. and Esterhuyse, A.J. (2013). Roles of fruit and Vegetables Consumption in Human Health and Diseases Prevention In: Oguntibeju, O.O (ed) Diabetes Mellitus-Insight and perspectives Intech. Pp. 117-130