INTRODUCTION

A parasite is an organism that resides on or within another living organism, the host in order to find the environment and nutrients required for its own growth and reproduction (Ochei and Kolhatkor, 2000) or it is an organism that is entirely dependent on another organism referred to as its host, for all or part of its life cycle and metabolic requirement (Arora and Arora, 2010). The ingestion of parasites by mouth is one of the commonest method of transmission of the parasites which can get to the intestine by ingestion of the food or water contaminated with faeces containing the infective stages of the parasites or ingestion of improperly cooked food, meat and vegetables or the ingestion of raw vegetables and fruits (Ochei and Kolhatkor, 2000) and by parasitic infestation it means the external parasitism of the parasites living on the external surfaces of the body (Ochei and Kolhatkor, 2000).

The cultivation of vegetables for commercial and domestic purposes in Nigeria is mostly carried out by farmers that depend on natural rainfall or irrigation (Luka et al., 2000) and these vegetables though seasoned are cultivated in the same piece of land every year, as a result of these continuous land usage, there is depletion of the nutrient hence the need for fertilizer or manure. Most farmers use untreated animals and humans faeces as manure, which are known to contain various species of parasites that are of both medical and veterinary importance (Okoronkwo, 1998) and the various species of parasites that are of both medical and veterinary importance (Okoronkwo, 1998) and the indiscriminate faecal deposition in bushes and farm land and the belief that deposition of such waste product will fertilize the land have further made the practice common by farmers and unlearned citizens and some of the water bodies used for irrigation are also...
polluted with parasites infected excreta, that could lead to recycling of infection (Ayer et al., 1992). It was also reported that the potential risk factors for humans intestinal parasitic infection caused by Ascaris lumbricoides, Trichuris trichiura, Ancylostoma duodenale, Necator americanus, Balantidium coli, Giardia intestinalis, Blastocystis hominis, involves unhygienic associations with unhygienic environment (Altekruse et al., 1997). Vegetables in its broadest sense refer to any kind of plant life or plant product, it is also commonly referred to as the edible portion of an herbaceous plants, roots, stems, leaves or fruits. These plants are either eaten fresh or prepared in a number of ways (Encyclopedia Britanica, 1969). It is a known fact that the use of excreta-polluted irrigation water is a health risk to the farmers and the consumers of the corps so produced. Raw wastewater frequently contains high numbers of eggs of human intestinal nematodes (Ayer et al., 1992). It has also been established that Market vegetables and fruits are often contaminated by eggs of human intestinal nematodes where night soil is extensively used as fertilizer or where wastewater reuse is practiced. Both crops consumed and the agricultural workers have been identified as being at risk from soil and waste-water transmitted infections. The direct application of night soil, animal manure and waste-water manure as an agricultural fertilizer has being practiced for centuries in many parts of the world, particularly in the Asian subcontinent and other continents like Africa (Shuval, 1986). The practice of using wastewater and animals and human waste is gaining prominence in developing countries as a result of the growing cost of mineral fertilizers and because of the increasing demand for basic food supplies. Indirect reserve of river which contains a substantial percentage of municipal refuse and sewage is also taking place in many developing countries (World Health Organization, 1999). Epidemiological studies have indicated that in areas of the world where helminthic diseases are endemic in the population, are where raw untreated waste-water is used to irrigate vegetables generally eaten uncooked. Fruits and vegetables gotten from fruits and vegetables cultivated using waste-water may lead to parasitic infestation which invariably leads to parasitic infections (Mara and Caira, 1989).

Therefore, this paper examines the human parasitic infestation of vegetables and fruits sold in Ekpoma markets.

MATERIALS AND METHODS

Study Area: Ekpoma, the study area is a town located in Esan West Local Government Area, Edo State, Nigeria. It is located between 6.700 N and longitude 6.130 E having a population of about 61.870 people whose occupations include farming, trading, civil service and studentship (National Population Commission, 2007). Some of the neighboring communities around Ekpoma Town are Uhiele, Emuhi, Illeh and Ujemen. Some of the neighboring Towns include Iruekpen, Irrua, Uromi and Ubiaja.

Study design: A cross-sectional systematic sample survey was undertaken at different markets in Ekpoma, which include The Ekpoma main market, Royal market and Iruekpen Market.

Inclusion criteria: Only vegetables and fruits brought to the study markets were used in this survey.

Exclusion criteria: vegetables and fruits outside the study area were not used in this study.

Study duration: This study was carried out from August, 2012 to February, 2013.

Sample collection: The samples includes Tomatoes, Spinach, Pumpkin leaf, Water leaf, Pineapples, Garden eggs, Carrots, Cabbages and cucumber were bought randomly from the different markets, labeled with date of collection, name of the sample, time and place of collection. They were then taken to the laboratory for examination.

Examination of samples: Each of the samples was examined carefully with the method described by Damen et al., (2007) at the parasitology unit of Medical Laboratory Science Department, Diagnostic and Research Laboratories, College of Medicine, Ambrose Alli University, Ekpoma.

Statistical analysis: Chi-square statistical analysis was then used to determine the various comparisons and the significant level was set at 95% confidence level, $\alpha = 0.05$, $p<0.05$ was interpreted as not statistically significant while $p<0.05$ was interpreted as statistically significant.

RESULTS

Out of a total of 250 samples which comprised of 195 samples of seven types of vegetables and 55 samples of two types of fruits collected in the three different markets in Ekpoma, 106 were infested with intestinal parasites giving an overall infestation rate of 42.4% (Table 1).

The parasites encountered include some species of protozoa and helminths. The protozoa parasites were Amoeba- Entamoeba histolytica and Entamoeba coli and Flagellates- Giardia lamblia; the helminth parasites

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<th>Table 1: Overall infestation of the samples</th>
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<td>Total no. examined</td>
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were Cestodes-*Hymenolepis nana*; Trematodes-*Gastrodiscoides hominis* and *Fasciola species* and Nematodes-*Trichuris trichiura*, *Strongyloides stercoralis*, *Ascaris lumbricoides* and Hookworm.

Table 2 show the intensity of infestation in different markets; the highest prevalence of 34 (48.60%) positive cases occurred in Iruekpen market, while the lowest prevalence of 26 (37.1%) occurred in Royal market Ekpoma.

Table 3 shows the infestation of various vegetables and fruits with water leaf having 25(10%) and 83.3% of positive specific percentage had the highest infestation while cucumber with 0(0.0%) and 0% of positive specific percentage had the lowest infestation.

Table 4 shows the infestation of different vegetables and fruits by various species of parasites with spinach found to have the highest poly-parasitic infestation of seven species of parasites, whereas cucumber was found to have nil and the analysis shows that infestation of different vegetables and fruits by various species of parasites shown to be statistical significant (p<0.05; X2 = 108.41).

**DISCUSSION**

In this study, a total of 250 samples comprises of 195 different types of vegetables and 55 different types of fruits were examined, out of which 106 (42.4%) were positive for different stages of different parasites. The result of this study is similar to the study carried out by Ali *et al.*, (2005) in Saudi Arabia where 26.0% contamination was recorded, Rodina and Saleh (2007) reported 37.0% in Gaza Palestine, in (Damén et al., 2007) reported 36.0% contamination in Jos Nigeria, Abougrain *et al.* (2009) in Iran reported 58.0%, Uga *et al.* (2009) reported 26.0% prevalence of infestation in Hanoi market in Vietnam, Ojemudia (2011) reported 56.3% prevalence of infestation in different markets in Jos Nigeria, Amaechi *et al.* (2011) reported 65.8% prevalence of infestation on vegetables and 34.2% prevalence of infestation on fruits in markets in Owerri Nigeria, Alli *et al.* (2011) reported 35.4% prevalence of infestation in market in Ibadan Nigeria, Glenn *et al.* (2012) reported 45.0% prevalence of infestation in metro Manila markets in Philippine while Omowaye and Audu (2012) reported 11.87% prevalence of infestation in Kogi market in Kogi Nigeria. The difference in the prevalence recorded in some of the studies done in other places can be attributed to the differences in sample sizes used, the techniques employed. The particular period of the year at which those studies were done could also affect the outcome. Damen *et al.* (2007) reported that there are high recovery of more stages of parasites on vegetables and
fruits at the summer because the organisms are attached more to them than in the winter when rain washes some of them off into water bodies and hygienic practises in those areas. Strongyloides stercoralis with 34 (32.1%) prevalence of infestation was the highest in this study which was in line with Ojemudia (2011), Damen et al. (2007), Omowaye and Audu (2012), who found Strongyloides stercoralis to have the highest contamination in their independent studies, although the percentage prevalence of infestation differs which could be attributed to difference techniques employed and also differences in the sample size used. The high prevalence of Strongyloides stercoralis could be because Strongyloides stercoralis life cycle has both parasitic and free living phases which enhance its proliferation. This agrees with the work of Feachem et al. (1980), whereas Alli et al. (2011), Abougrain, A., H. Mohamed and S. Nuri, 2009. Parasitological contamination in salad vegetables in Tripoli-Libya. Fd. Crl., 5: 54-56.

Conclusively, this study shows that vegetables and fruits sold in Ekpoma markets environs are highly contaminated with human parasites. This could be responsible for the high prevalence of intestinal human parasites in the study area. This study also affirms that consumption of poorly prepared food could serve as a major means of transmission.

ACKNOWLEDGMENT

The authors are grateful to Mr. and Mrs. Gabriel Uzairue whom God used to finance this research work and the staff of Medical Diagnostic Laboratory, College of Medicine, Ambrose Alli University, Ekpoma.

REFERENCES


