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Prevalence of Intestinal Parasites on Some Selected Fruits Sold In Kashere Market, Akko L.G.A. Gombe State, Nigeria.

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Abstract
This study determined the prevalence of intestinal parasites on some selected fruits sold in Kashere Market as nature of consumption of fruits has been a major source of food born parasitic infection. A total of one hundred and forty (140) fruits of seven (7) different varieties were examined for intestinal parasites using sedimentation method. Ninety two (92) out of 140 samples were positive for intestinal parasites microscopically. Among these fruits, mango had the highest number of intestinal parasites which was 18 (90%) and the lowest was recorded in banana 7(35%). Stages of parasites found were Ova of *Ascaris lumbricoides* 22(23.9%); cyst of *Entamoeba histolytica* 9(9.7%); eggs of Hookworm i.e. *A. duodenale* 15(16.3); Larvae of *Strongyloides stercoralis* 10(10.8%); protozoa (cyst of *Giardia lamblia*) 10(10.8%); *Hymenolepis nana* 3(3.2%); eggs of nematodes (*Enterobius vermicularis*) 11(11.9%); *Trichuris trichuria* (6.5%); eggs of *Clonorchis sinensis* 6(6.5%). Data were subjected to two way analysis of variance (ANOVA) and it showed that there was significant difference (p<0.05) on the prevalence of intestinal parasites on the seven (7) variety of fruits sampled. Result shows high level of fruits contamination with intestinal parasites in Kashere Market, pointing to a great risk of acquiring and transmitting intestinal parasitic infections by eating improper unwashed fruits. It is recommended that proper hygiene and washing of fruits should be observed before consumption in order to reduce the rate of illness caused by intestinal parasites which results to high mortality rate in the world today.

Key words: Prevalence, Parasites, Fruits, Contamination, Kashere.

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Introduction

The consumption pattern of fruits by certain group of people has been a major source of fruit born parasitic infection. Fruits are fleshy seed associated structures of a plant that are sweet or sour and edible in the raw

state, such as orange, banana, grape, strawberry, apple, lemon, water melon, cucumber etc. Fruit and vegetables are good sources of mineral elements such as iron, vitamins: vitamin C (Ascorbic acid), vitamin B12 (Cobalamin), Vitamin B3 (Niacin) and Vitamin B2 (Riboflavin) for their nutritive value. Man has been utilizing fresh fruits for the production of consumables like juices, jams, beverages and wines or eaten directly as food (Yoila and Otitofon, 2016).

The continued use of untreated waste water and manure as fertilizer in the production of fruits and vegetables is a major contributing factor to contamination, thereby causing numerous diseases.

At the same time the consumption of raw fruits and vegetables plays a major epidemiological role in the transmission of parasitic food borne diseases. Many outbreaks of protozoan infections in humans have been linked to the consumption of raw fruits and vegetables. Previous studies have revealed that different vegetables and fruits purchased at markets in different regions from many developing countries were contaminated with Helminthes eggs as well as protozoan cysts (Auta *et al*., 2017; Uneke, 2004; Yoila and Utitofon, 2016).

Various factors contribute to increase in disease associated with raw consumption of fruits and vegetables, which include globalization of food supply; introduction of pathogens into new geographical areas through importation; use of untreated waste water and manure as fertilizers for crop production; irrigation and various agronomic practices; lack of observing food handlers; importation and consumption of genetically modified fruits *etc*. some of these fruits and vegetables are eaten raw within the metropolis and sometimes in combination with cooked food (Auta *et al*., 2017).

Globally, parasitic infections affect millions of people. In some regions, they are a major cause of diarrhea and stunted growth among children, and also cause significant economic losses related to human health and to agriculture. Amongst the classes indicted are Protozoa, Cestodes, Trematodes and Nematodes (Auta *et al*., 2017). Studies have shown that the presence of helminthes egg and protozoa cyst on fresh fruits and vegetables are agents of gastrointestinal infections (Auta *et al*., 2017).

Nigeria like other West African countries often eat raw and unwashed fruits. It is disturbing that one of the common practices among fruit and vegetable vendors is that they wash the fruits and vegetables with water from unknown sources (Auta *et al*., 2017). However, fruits play major role in the nutritional livelihood of human population especially in undeveloped countries like Nigeria where there are poor socio-economic conditions (Omowaye and Idachaba, 2012).

In addition, contaminations of food with parasites also occur during farm operation particularly through inorganic farming and people do not wash the fruits properly before eating. Eating unclean, raw or undercooked fruits and vegetables is one of the means by which the transmission of intestinal parasitic infections is propagated (Alli *et al*., 2011).

The climate and topography of north east Nigeria are suitable for growth of these fruits throughout the year, using rain during wet season and irrigation during dry season; these two sources of water are highly polluted with human and animal faeces which represent high risk to farmers and consumers of the fruit products (Alli *et al*., 2011). Fruit taken to the markets are often contaminated by eggs of intestinal nematodes where human and animal faeces are extensively used as fertilizer and untreated waste water (Alli *et al*., 2011).

In view of the interface between fruits and parasites, there is need for an increasing awareness because parasitic diseases continue to be a major public health problem with associated high degree of morbidity and mortality. Additionally, parasitic infections are associated with a high incidence of dysentery, chronic colitis, anemia and intestinal obstruction. The effect of this on children is that it consumes nutrients, weaken the immune system as well retard physical and mental development. Furthermore, it also leads to intrauterine growth retardation, prematurity

and also birth weight among newborns to infected mothers. According to WHO, parasites are one of the leading causes of death after HIV/AIDS and tuberculosis. One out of ten living persons suffers from one or more seven major tropical diseases of which fruit are seen to be parasitic in nature (Arora and Arora, 2010).

Intestinal parasitic diseases constitute a global health burden in many developing countries mainly due to fecal contamination of water and food through climatic, environmental and socio-cultural factors enhancing parasitic transmissions. These parasites dwell in the gastrointestinal tract in humans and other animals. In urbanized countries, protozoan parasites commonly cause gastrointestinal infections in contrast to helminthes. Amoebiasis is the third most important reason for death from parasitic diseases wide-reaching, with its furthermost impact on the people of developing countries (Arora and Arora, 2010).

Intestinal helminthes hardly ever cause death. As an alternative, the saddle of disease is related to less mortality than to the chronic and subtle effects on health and nutritional status of the host. In addition to their health effects, intestinal helminthes infections also damage physical and mental development of children, prevent educational achievement, and hamper economic development. The common parasites related to the preceding systematic investigations include *Ascaris lumbricoides,* hookworms *(Necator americanus), Trichuris trichiura, Strongyloides stercoralis, Entamoeba histolytica, and Giardia intestinalis.* These health issues thrive as a result of lack of personal hygiene, piteous environmental care, inadequate health services, and lack of proper awareness of the transmission mechanisms and life-cycle patterns of these parasites (Dhanabal *et al*., 2014).

The major way of selecting the appropriate intervention steps to reduce population to pathogenic microorganism on fruits is to identify source of contamination and ecology of pathogens as it is affected by their processing practice (Yoila and Utitofon, 2016).

Fruits are widely used in the world today and serve as an important class of food needed in the body. As a result of poor hygiene associated with fruits processing and consumption, food borne intestinal disease is the result. This present problem needs to be addressed by identify the various species of parasites and degree of parasitic infestation on some selected fruits sold in Kashere market, Akko L.G.A., Gombe State.

Materials and Methods

Study area

Kashere is a town in Akko Local Government Area of Gombe State, Nigeria. It is located at an elevation of 431 meters above sea level and its population amounts to 77,105 (National Population Commission, 2006). Kashere lies on the geographical coordinates of 9° 46' 0" N, 10° 57' 0" E (Fig. 1).

Samples collection

Within the months of August and September, 2019 seven different variety of fruits' samples such as Orange (*Citrus sinensis*), Sweet melon, Water-melon (*Citrullus lanatus*), Banana (*Musa acuminata*), Mango (*Mangifera indica*), Lemon (*Citrus lemon*) and Garden egg (*Solanum melongena*) were collected from Kashere Market for the study. Being an undergraduate research and time frame is limited to August and September, 2019, twenty fruit samples in each variety were purchased from different vendors at different locations for the research. The samples were collected using a polythene bags and transported to the Biology laboratory of the Department of Biological Sciences, Federal University of Kashere for parasitological analysis.

Sedimentation Methods

Washing Procedures

A sedimentation technique was used in which 20 samples of each fruits' surface were washed in 100mL of distilled water separately in a sterile beaker for each preparation. The water was left to settle for

30 minutes and then the settled water was decanted and discarded without disturbing the settled suspension. The suspension was strained through a sterile sieve to remove undesirable materials like sand. 15mL of 10% formalin was added to the filtrate. The solution formed from the addition of 10% formalin to the filtrate was stirred fervently and put into the centrifuge tube. The tube was then place in a centrifuge and spun at 3000rpm for 5 minutes (Damen *et al*., 2007). The resulting supernatant was decanted and discarded to leave only the sediment for laboratory analysis.

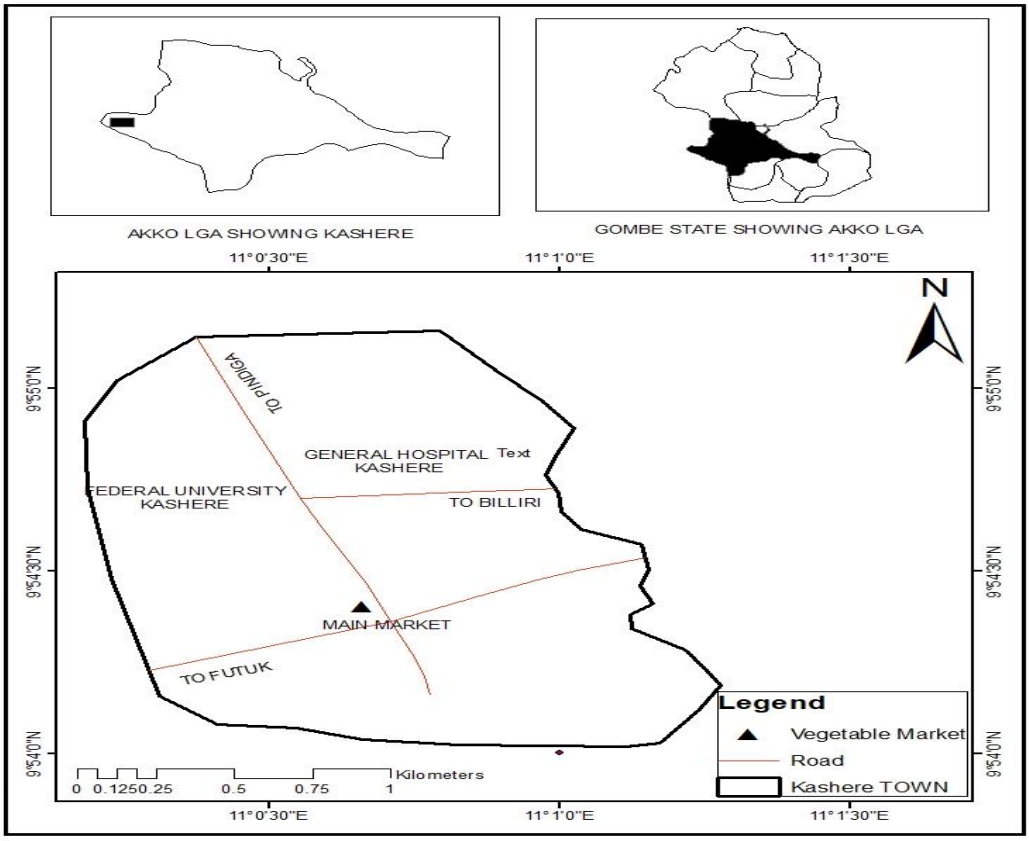

Figure 1: Map of Kashere, Showing the Study Area (Kashere Market)
Source: Gombe State University GIS Laboratory, 2019.

Laboratory Analysis

The sediment were tapped to mix and a drop was applied at the centre of a clean glass slide then a drop of Lugol's iodine was added on it. The glass slide was covered gently with cover slip to avoid air bubbles and over-flooding. The slide was then placed on a microscope and X10 and X40 objectives lenses were used for viewing the number of ova, larvae and cysts of the parasites which were isolated, counted and recorded respectively according to Nyarango *et al*., (2003).

Identification of parasites

The cysts, eggs and larvae of the parasites were identified by their morphological characteristics such as the shapes and size of the eggs and larvae using the method of Arora and Arora, (2010).

Statistical Analysis

The data generated were analyzed using Statistical Package for Social Science (SPSS) version 20.0. The result obtained were analyzed using two way Analysis of Variance (ANOVA) for any significant difference of intestinal parasites identified on the fruit's samples at (p<0.05) level of significance.

Results

Out of the one hundred and forty (140) samples examined for the intestinal parasites. Ninety two (92) out of the (140) fruits representing 65.7% were positive for the intestinal parasites microscopically. Among these fruits, mango had the highest number of intestinal parasites which was 18 (90%) positive and the lowest was banana 7(35%) (Table 1).

Table 2 shows the prevalence of intestinal parasites contamination among fruits sampled with greater risk of infection. *Ascaris lumricoides* 22(15.7%) recorded the highest parasite prevalence while *Hymenopis nana* 3 (2.1%) was the least.

Table 1: **Percentage prevalence of intestinal parasites on some fruits sold in Kashere main Market, Akko L.G.A. Gombe State**.

Fruits	Number examined	Number contaminated (%)
Water melon	20	16 (80.0%)
Orange	20	15 (75.0%)
Mango	20	18 (90.0%)
Sweet melon	20	10 (50.0%)
Garden egg	20	14 (70.0%)
Guava	20	12 (60.0%)
Banana	20	7 (35.0%)
Total	**140**	**92 (65.7%)**

Table 2: The prevalence of intestinal parasites contamination among fruits sampled (mango with 90% of parasites) with greater risk of infection

	Water melon	Orange	Mango	Sweet melon	Garden egg	Guava	Banana	Total (%)
Types of parasites	**20(%)**	**20(%)**	**20(%)**	**20(%)**	**20(%)**	**20(%)**	**20(%)**	**140(%)**
A. lumbricoides	4(20%)	2(10%)	5(25%)	2(15%)	3(15%)	3(15%)	3(15%)	**22(15.7%)**
Hookworms	3(15%)	2(10%)	4(20%)	0(0%)	2(10%)	2(10%)	2(10%)	**15(10.7%)**
E. histolytica	0(0%)	2(10%)	3(15%)	1(5%)	2(10%)	1(5%)	0(0%)	**9(6.4%)**
G. lamblia	1(5%)	4(20%)	2(10%)	0(0%)	1(5%)	2(10%)	0(0%)	**10(7.1%)**
C. sinensis	2(10%)	1(5%)	1(5%)	1(5%)	1(5%)	0(0%)	0(0%)	**6(4.3%)**
T. trichuria	1(5%)	0(0%)	0(0%)	2(15%)	0(0%)	3(15%)	0(0%)	**6(4.3%)**
E. vermicularis	3(15%)	3(15%)	1(5%)	2(10%)	1(5%)	0(0%)	1(5%)	**11(7.9%)**
S. stercolaris	2(10%)	1(5%)	2(10%)	1(5%)	3(15%)	0(0%)	1(5%)	**10(7.1%)**
H. nana	0(0%)	0(0%)	0(0%)	1(5%)	1(5%)	1(5%)	0(0%)	**3(2.1%)**
Total	**16(80%)**	**15(75%)**	**18(90%)**	**10(50%)**	**14(70%)**	**12(60%)**	**7(35%)**	**92(65.7%)**

Discussion

Fruits constitute the essential part of our daily meals and serve as the rich sources of vitamins, minerals, protein, energy and can be very useful in treating malnutrition related to protein energy deficiencies. However, the daily consumed fruits have been reported to be frequently contaminated with different Helminthes and Protozoan parasites throughout the world (W.H.O., 2015). Food-borne parasitic infections have received little attention in developing countries and these organisms contaminate fruits while still on the field and are usually transmitted by contaminated water and spread by ineffective hygienic practices (Alli *et. al*., 2011).

A total number of 140 fruits were examined from seven varieties, out of which 92(65.7%) were positive for intestinal parasites in which Mango recorded the highest contamination 18(90%) while Banana recorded the least contamination of 7(35%). This could be because Mango is sticky and a little bit rough than Banana which has smooth epicarp. Generally, fruits are contaminated during harvesting, transporting, processing, distributing and marketing, and are usually transmitted by contaminated water and spread by ineffective hygienic practices in our homes and market places. The presence of intestinal parasite on fruits samples is suggestive of fecal contamination from man and animal origin (Auta *el al.*, 2017).

In view of the result above, it is noted indeed that there is high contamination of intestinal parasites on collected fruits sampled. The high prevalence of contamination with parasites on fruits could be due to the fact that the market is characterized by the presence of refuse dumping sites nearby, poor drainage, improper disposal of feces and poor hygienic practices. These produce were usually brought into the market from rural areas around where unhygienic practices are their habits and also the produce were usually display for sale on the ground expose to dusts and flies was common.

This finding where prevalence rate of 65.7% found is higher than the study by Yoila and Otitofon, (2016) who recorded a prevalence of 42% in Abuja, of which pineapple recorded the highest contamination 82(68.3%) while banana recorded the least contamination 33(27.5%). This finding was also higher than that of Alli *et al*., (2011) who recorded 35.4% prevalence of intestinal parasites on fruits available in Ibadan market. A study by Uneke, (2004) conducted in Abakaliki, reported that 34 ova isolated from fruits, 30 were positive in pineapple fruits. This attributed to the un-even surface of pineapple fruit to be contaminated either in the farm or when washed with contaminated water. But fruits like banana recorded the least contamination of 7(35%) with parasites in this research. This is in line with findings of Yoila and Utitofon (2016) who reported that banana had the least contamination of (27.5%). This is due to the smooth skins of the banana fruit which makes it easy for the eggs, larvae or cysts of the parasites to be washed off even with the slight washing usually done at the point of harvest prior to sale.

The diverse occurrence of different parasites however, was unique in this study where nine (9) different parasites were encountered suggesting a high level of contamination of fruits in this area. This is contrary to the study of Malann and Soso, (2012) very few different parasites in their study were encountered which includes (33.30%) for *Ascaris lumbricoides* as the highest out of (51.60%) positive for parasites contamination on vegetables. But this findings is in line with the study of Omowaye and Idachaba (2012) who isolated larvae of *Strongyloides stercoralis* (12.60%), egg of *Enterobiu svermicularis* (2.42%), eggs of *C. sinensis* (4.7%) and cysts of *Entamoeba histolytica* (0.62%) from fruits samples in Kogi State.

Also in Western part of Nigeria, Alli *et al*. (2011) isolated three different types of intestinal parasites from 96 fruits in Ibadan, these intestinal parasites include ova of *Ascari slumbricoides* 19 (55.9%), ova of hookworm 11(32.3%), and *Strongloide*

sstercoralis (11.8%) which is not in line with the present study. In the same vein, this research is in line with Hassan *et al*. (2013) who conducted research in Southwestern Nigeria which immature cyst of *Entamoeba histolytica*/dispar (6.42%), *Trichuris trichuira* eggs (4.55%). However, this finding is in contrast with what was reported by Damen *et al*. (2007) who isolated *Trichomonas hominis* (24.9%); Ova of *Ascaris lumbricoides* (17.1%); Ova of Hookworm (19.8%); *Entamoeba histolytica* (14%); *Strongyloides stercoralis* (16.7%); *Trichuris trichuria* (5.1%) and *Hymenolepis snana* (2.4%) in Jos, North central part of Nigeria. The present study is similar to the work done by Yoila and Utitofon, (2016) in terms of number of parasites as eight (8) were recorded in their work at Gwagwalada, Abuja while nine (10) in Kashere, Gombe.

In Southwest Ethiopia, Tefera *et al*., (2014) isolated larvae of different species of parasites: *Strongyloides stercoralis* (21.9%); ova of *Toxocara* species (14.7%); *Cryptosporidium* species (12.8%); *Hymenolepis nana* (8.3%); *Gardia lamblia* (7.5%); *Ascaris lumbricoides* (6.7%); *Entamoeba histolytica*/dispar (5.3%); *Cyclospora* species (5.0%) and *Hymenolepis diminuta* (1.4%) from fruits and vegetables, which is in contrast with the present study. The differences observed might be due to the difference in climatic conditions and geographical location.

Conclusion

In conclusion, the findings of this study point to the fact that the fruits selected in this study are highly contaminated with intestinal parasites. Thus, improper washing of the fruits prior to consumption can indeed lead to severe public health consequences. As such, more effort is needed in creating awareness as the problems result in poor sanitary environment of the markets and unhygienic transportation of the produce to the markets. Most a time the fruits are often put on the ground before selling to the consumer. Based on findings, also sound warning to the fruit's sellers, consumers or indiscriminate handlers of such produce are cautioned about the consequences they face while buying, selling and consuming contaminated fruits. The purpose of this research is achieved by creating awareness on the wide spread of intestinal parasites on fruits whose harmful effect avoidable among the populace of Kashere town and villages around.

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