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# Prevalence of Geohelminth Eggs Associated with Selected Fruits and Vegetables in Gombe Metropolis

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## ABSTRACT

This study was conducted to determine prevalence of geohelminths eggs associated with selected fruits and vegetables in Gombe metropolis. A cross sectional study was carried out with a total of 400 fruit and vegetable samples was collected within two periods between March-April 2020 and August-September 2020. Floatation techniques was used to recover the Nematode and Cestode eggs and were identified based on their morphological characteristics using atlas of Medical Helminthology and Protozoology. Four helminth species were discovered; *Ancylostoma duodenale*, Ova of *Ascaris lumbricoides*, Ova of *Trichuris Trichiura* and *Strongyloides stercoralis*. Gombe main market has the highest prevalence of geohelminth eggs on fruits and vegetables while least prevalence of geohelminth eggs was recorded in Gabukka market However, dry season have the lowest prevalence than the raining season. This research recommends periodic de-worming of all individuals consuming fruits and vegetables at a regular intervals and consumers of such fruits and vegetable should always wash with vinegar and salt before consumption respectively. All vendors of fruits and vegetables should be educated on the risk associated with contamination of geohelminth eggs and improvement of sanitary facilities and promoting safe disposal of waste is strongly emphasized.

**Keywords:** Fruits, Geohelminth, Season, Vegetables, Gombe

## INTRODUCTION

Helminthes refers to groups of worms that live as parasites in both human and animal bodies. Parasites are classified among the most pathogenic factors causing contagious diseases in humans according to the World Health Organization (WHO, 2019). Epidemiological studies show that vegetables are contaminated with parasite eggs, larvae and cyst forms due to irrigating vegetables with untreated wastewater in epidemic areas, and humans are infected after consuming raw contaminated vegetables (Kozan *et al*., 2005; Ahmed and Karanis, 2018). . Vegetables also perform a crucial role in providing of low quantity of fat and carbohydrate as these are essential components for healthy life (Bashir *et al*., 2020).

Looking at the importance health benefits of vegetables to humans, the WHO recommended the intake of a minimum of 400g of vegetables and fruits per day so as to control the above-mentioned ailments (Punsawad *et al.,* 2019).Conversely, vegetables that are eaten raw can become contaminated more particularly with soil-transmitted helminths (STH) parasites if not appropriately washed. Several studies have shown that eating of raw vegetables is one of the major courses by which STH are

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disseminated which affects more than a quarter of the world population (Jourdan *et al.,* 2018; Mohamed *et al.,* 2016). The magnitude of infectivity of vegetables with STH is related to the numerous unhygienic practices such as the use of untreated wastewater contaminated with sewage for irrigation (Tefera *et al.,* 2014). This is may be due to most farmers that cultivate vegetables depend on irrigation and natural rainfall. Other reasons such as planting, preparation or during processing, collection, post-harvest handling, and storage, transporting to market and other unhygienic condition at home can be associated with vegetables contamination (Luz *et al.,* 2017). Therefore the research aimed at determines the Prevalence of geohelminth eggs on selected fruits and vegetables in Gombe metropolis.

## MATERIALS AND METHODS

### Study Area

This study was conducted in Gombe Local Government which consists of eleven wards. It's located in northeastern Nigeria within latitudes $10^0$ 283333N and longitude $11^0$ 166667E with the total population of 596,233 according to world population review 2024. It is divided into Gombe South and North, where Gombe South comprises of five wards namely Bolari East and West, Kumbiya Kumbiya, Gabukka, and Jekadafari while Gombe North comprises of Dawaki, Herwa Gana, Ajiya, Bajoga, Shamaki and Nassarawo (Figure 1). Rainy season is observed between May to October and dry season comes up from November to April. It is bounded by Kwami LGA to the North, Akko LGA to the Southwest and Yamaltu-Deba LGA to the East.

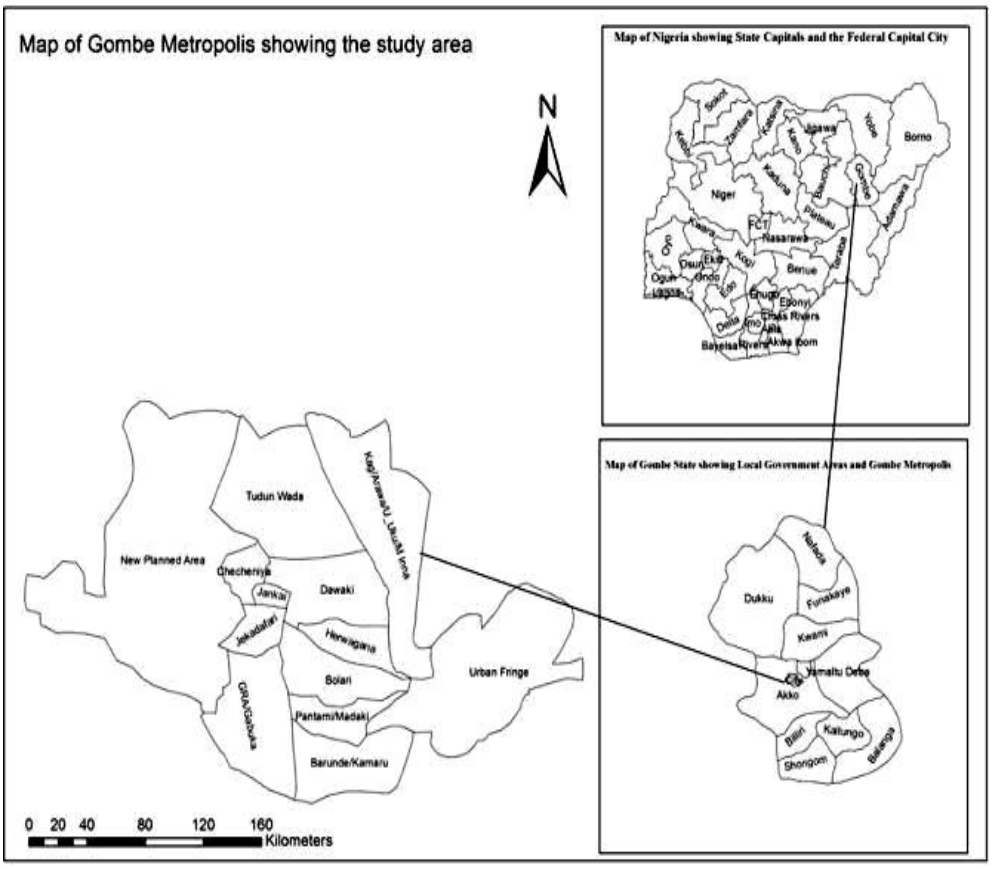


**Figure 1:** Map of Gombe study area.

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**Study Design**

A cross-sectional study design was carried out. Fruits and vegetables samples were collected from five markets within Gombe metropolis that make up Gombe Local Government. Fruit and vegetable samples were collected from Gombe main market, old market, Leprosy, Tudun wad and Gabukka markets respectively. An analysis of fruit and vegetable samples was carried out to determine the cyst or larvae. A sample collection form was used during sample collection to record the markets name, level of sanitation, vegetative coverings, and presence of stray animals and detection of fecal matter.

**Study Population**

Markets in Gombe were selected using simple random sampling technique. The different sites for the sample collection were identified and numbered. A cross sectional study was carried out with a total of 400 fruit and vegetable samples was collected within two periods between March-April 2020 and August-September 2020.

**Collection of Samples**

Prior to the unset of the research consent was sent to the markets were samples would collected,

Samples were obtained using simple random, in each market an average of 40 fruits and vegetables were collected for two seasons. All collected samples were taken to parasitology laboratory for analysis at Biochemistry department laboratory of Gombe State University.

Mango, cashew, garden egg and tomatoes are the fruits that were collected while lettuce, spinach, sesame, carrot, roselle and bitter leaf are the vegetable samples collected all for the two seasons.

An interview was granted to the fruits and vegetables vendors at the point of purchase as to whether they use salt or other chemicals in washing them before selling, the interview was sought to obtain information regarding their level of hygiene and level of awareness of geohelminth parasites, how many times those the seller wish the vegetables or fruits, what reagent the seller apply on the fruits or vegetables during washing and those the seller sells the fruits or vegetables unwashed..

**Laboratory Analysis of Samples**

***Floatation method***

A solution of zinc sulphate was formed upon dissolving 10% zinc sulphate in distilled water. Samples of each fruit and vegetable were brought to laboratory in a polythene bag, each of the samples was washed with distilled water in a sterile plastic container for the removal of parasitic ova, and the undesirable materials were removed through a sterile seiver.

The filtrate was centrifuged at 2500 revolutions for 5 minutes and the supernatant was discarded into the disinfectant jar. The sediment obtained was re-suspended in zinc sulphate floatation fluid and re-centrifuged at 2500 revolution for 2 minutes before the floatation fluid was added to fill to the brim and a cover slip was super-imposed on it. The cover slip was lifted and examined under microscope at, X10 and X40 objectives.

***Identification and counting of eggs***

Identification of geohelminth ova were made based on the characteristics and morphological features of the as described by Soulsby (1982), with the aid of atlas of Medical Helminthology and Protozoology. Churchill Livingstone, Edinburgh, 1968. The slide prepared was observed under microscope at, X10 and X40 respectively

**Data Analysis**

Chi square was used to test for significant association between the variables p values ($\leq 0.05$) were considered significant.

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## RESULTS

### Distribution of Geohelminths Eggs Recovered from the Selected Markets

Table 1, shows the distribution of geohelminth recovered from the selected markets. Main market was found to have the highest number of eggs detected of 28(30.11%), Old market with 21(22.58%), Leprosy with 11(11.83%), Tudun wada with 20(21.51%) and Pantami with 13(13.97%). However, *Ascaris* was found to have 35(36.57%) across the markets, Hookworm with 42(45.16%), *Trichuris* with 14(15.05%) and *strongyliode* with 2(2.15%). There was a significant association between the distributions of geohelminthes eggs across the selected markets.

**Table 1:** Distribution of Geohelminth species across the selected markets

| Markets/species | *Ascaris lumbricoides* | *Ancylostoma duodenale* | *Trichuris trichiura* | *Strongyloide stercoralis* | Total |
|---|---|---|---|---|---|
| Main | 11(31.43%) | 12(28.57%) | 4(28.57%) | 1(50.0%) | 28(30.11%) |
| Old | 9(25.71%) | 10(23.81%) | 2(14.29%) | 0(0.00%) | 21(22.58%) |
| Leprosy | 5(14.29%) | 3(7.14%) | 3(21.43%) | 0(0.00%) | 11(11.83%) |
| Tudun wada | 6(17.14%) | 9(21.43%) | 5(35.71%) | 0(0.00%) | 20(21.51%) |
| Pantami | 4(11.43%) | 8(19.05%) | 0(0.00%) | 1(50.0%) | 13(13.97%) |
| Total | 35(37.63%) | 42(45.16%) | 14(15.05%) | 2(2.15%) | 93(100%) |

$x^2 = 10.4739$ df =4 p =0.0315

### Distribution of Geohelminths Eggs Recovered from the Selected Markets

Table 2, shows the association between geohelminth eggs recovered and fruit and vegetable samples. From the 200 samples collected, 93(23.25%) were positive to geohelminth egg. Out of the 93(23.25%), mango fruit have 8(8.6%), Garden egg fruit with 4(4.30%), carrot fruit with 12(12.90%), cashew fruit with 3(3.25%), Tomato fruit with 6(6.45%), Lettuce was found to have the highest number of eggs detected in among vegetable samples with 20(21.51%), Spinach with 17(18.28%), Sesame with 9(9.67%), Bitter Leaf with 8(8.60%) and Roselle with 6(6.45%). However, *Ascaris* was found to have 35(36.57%) across the markets, Hookworm with 42(45.16%), *Trichuris* with 14(15.05%) and *strongyliode* with 2(2.15%). There was a significant association between the distributions of geohelminthes eggs recovered among fruit and vegetable samples.

**Table 2:** Total Distribution of Geohelminths eggs recovered among Fruit and Vegetable Samples

| Geohelminths | *Ascaris lumbricoides* | *Ancylostoma duodenale* | *Trichuris trichiura* | *Strongyloide stercoralis* | Total |
|---|---|---|---|---|---|
| Mango | 2(5.71%) | 5(11.90%) | 1(7.14%) | 0(0.00%) | 8(8.60%) |
| Garden egg | 2(5.71%) | 2(4.76%) | 0(0.00%) | 0(0.00%) | 4(4.30%) |
| Carrot | 4(11.43%) | 7(16.66%) | 0(0.00%) | 1(50.00%) | 12(12.90%) |
| Cashew | 3(8.57%) | 0(0.00%) | 0(0.00%) | 0(0.00%) | 3(3.25%) |
| Tomato | 2(5.71%) | 3(7.14%) | 1(7.14%) | 0(0.00%) | 6(6.45%) |
| Bitter leaf | 3(8.57%) | 4(9.52%) | 1(7.14%) | 0(0.00%) | 8(8.60%) |
| Spinach | 8(22.86%) | 6(14.28%) | 3(21.43%) | 0(0.00%) | 17(18.28%) |
| Lettuce | 9(25.71%) | 8(19.04%) | 3(21.43%) | 0(0.00%) | 20(21.51%) |
| Sesame | 0(0.00%) | 4(9.52%) | 4(28.57%) | 1(50.00%) | 9(9.67%) |
| Roselle | 2(5.71%) | 3(7.14%) | 1(7.14%) | 0(0.00%) | 6(6.45%) |
| Total | 35(37.63%) | 42(45.16%) | 14(15.05%) | 2(2.15%) | 93(100%) |

$X^2$ =25.9875 df =*9 p< 0.05*

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**Seasonal Distribution of Geohelminths Eggs Recovered from the Selected Markets**

Five markets were selected at random and forty (40) samples were collected from the selected market, of both fruits and vegetables during dry and raining season. Main market have the highest contamination of 28(30.11%), Old market with 21(22.58%), Leprosy with 11(11.83%), Tudun Wada with 20(21.51%), and Pantami market with 13(13.97%). However, dry season have highest prevalence of 60(64.52%) and raining season with 33(35.48%). There was no significant association between season of the year and the selected markets. The table 8 below shows the level of seasonal prevalence of geohelmimth egg in the selected market.

**Table 4:** Seasonal Prevalence of Geo-helminth Eggs in the selected markets

| Markets/seasons | Dry | Raining | Total |
|---|---|---|---|
| Main | 18(30.00%) | 10(30.30%) | 28(30.11%) |
| Old | 17(28.33%) | 4(12.12%) | 21(22.58%) |
| Leprosy | 5(8.33%) | 6(18.18%) | 11(11.83%) |
| Tudun wada | 11(18.33%) | 9(27.27%) | 20(21.51%) |
| Pantami | 9(15.00%) | 4(12.12%) | 13(13.97%) |
| Total | 60(64.52%) | 33(35.48%) | 93(100%) |

$X^2 = 5.142$ df $=4$ $p > 0.05$

## DISCUSSION

Geohelminth ova and larvae were discovered from the fruits and vegetables scrutinized in the research region. This showcases a serious risk public health problem due to faecal contamination. This could be ascribed by people's poor sanitation practices, right from the planting to harvesting period of the fruits and vegetables, and are frequently connected with the use of dungs from domestic animals and human excreta as manure, as well as use of urban waste water for irrigation (Nasiru *et al*., 2015). To prevent the persistent distribution of STH infections that comes from eating unclean fruits and vegetables. It is important to painstakingly washed Fruits and vegetables so as to avoid being purulent with intestinal helminths infection.

Results reveals that Gombe Main market has the highest prevalence of geohelminths, followed by Tudun Wada market and Gabukka market and the least was Leprosy market and Old market. Fruits and vegetables with the high prevalence of geohelminths in open markets are associated with the presence of refuse dumping sites nearby, poor drainage, inappropriate disposal of faeces from the populace and poor unhygienic habit (Michael *at el*., 2012).

Four geohelminth species were recovered from four hundred samples of edible fruits and vegetables collected from the selected markets areas. This includes *Ancylostoma duodenale*, Ova of *Ascaris lumbricoides*, Ova *Trchuris trichiura* and *Strongyloides stercoralis*. Geohelminths species disparity recorded may be due to diversities in the geographical location of the study. *Ascaris lumbricoides* and Ova of Hookworm were common to all fruits and vegetables in all the studies sites, regardless of variation in isolated parasites. This could be due to the fact that the parasites can endure a wide variety of adverse ecofriendly conditions observed by Mohamed *et al*. (2016).

Helminth eggs contaminate vegetable samples in greater degree from the selected markets. The high contamination associated with vegetables, because vegetables are nearer to the soil than fruits and the leaves of vegetables could retain some dirt, which cannot washed away by mare washing and the fruits are higher above the soil level than the vegetables. Carrot and Lettuce were the most

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contaminated vegetables which were closely related with the study of Nasiru *et al*. (2015), who recorded 28.2% from lettuce sample, followed by spinach while among the fruit mangos have the highest prevalence. Roselle has the least prevalence among vegetable samples. Cashew, Garden egg and Tomato were found to have the least contamination in the fruit sampled. Transmission of Parasitic disease may be influenced by poor environmental situation, poor personal hygiene and the use of animal wastes as manure as well use of urban waste water for irrigation (Nasiru *et al*., 2015).

However, dry season have the lowest prevalence and raining season have the highest prevalence.

It has been recommended that total rainfall in an area and its seasonal distribution may also help explain observed patterns of infection: wetter areas are usually associated with improved transmission of all three major soil-transmitted helminth infections. The reason for high raining season could be because of the fact that raining season favors' the multiplication and distribution of helminth eggs by providing optimum condition and conducive environment for their survival. The implication of this is that season affects the distribution of geo-helminth eggs leading to high helminthic infections (Chigozie, 2014).

## CONCLUSION

The study showcase high level of contamination of vegetables in both dry and rainy season when compared with fruits and the species of geohelminth recorded are; *Ancylostoma duodenale* (hook worm) *Ascaris lumbricoides, Tichuris trichuira* and *Strongyloides stercoralis.* It is recommended that all vendors of fruits and vegetables should be well-informed on the risk associated with contamination of geohelminths as such washing with vinegar or salt respectively is advisable before presenting to sellers and Periodic de-worming should be encouraged in all individuals consuming fruits and vegetables at a regular intervals.

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