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# INCIDENCE OF PATHOGENS IN FRUITS AND VEGETABLES IN TROPICAL BWARI TOWN

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***Abstract***

***Introduction:*** *In numerous tropical regions of developing nations, the prevalence of foodborne illnesses is perceived to be more severe than in developed countries, due to insufficient food safety initiatives or the lack of a structured institutional framework for street food vendors. The study's objectives of examining microorganisms associated with fruits and vegetables, the prevailing temperature and the hygiene practices of various fruit and vegetable sellers were all met.* ***Methods:*** *A self-designed questionnaire completed by twenty vendors were used. Laboratory techniques like serial dilution, biochemical testing, and culture techniques were used. A handheld thermometer was used to determine the prevailing temperature, and descriptive statistics using Microsoft Excel was used to analyze data.* ***Results and Discussion:*** *Statistical analysis revealed that 80% of vendors had washing facilities, 70% worked in a clean environment, 20% washed their hands before handling fruits, 70% dressed correctly, and 70% kept their fruits and vegetables above the WHO temperature standard. A laboratory investigation revealed the bacteria counts of (watermelon being the highest 8.3×105, cucumber 5.4×105, carrot 2.3×105, orange 3.7×105). Microbial species encountered were Staphylococcus aureus, Escherichia coli, Salmonella species, amongst others, which increases health risk.* ***Conclusion:*** *The study concluded that temperatures, handling processes, and inadequate hygiene all had impact on fruits and vegetables sold in tropical Bwari area. It also established a link between temperature and the prevalence of bacteria in fruits and vegetables. As a result, the study suggests monitoring and surveillance of fruit and vegetable sellers, national vendor hygiene policies and public awareness.*

## INTRODUCTION

Fruits and vegetables are an excellent nutritional source of vitamins and fiber for humans, and they are essential for good health and wellness. Well-balanced diets high in fruits and vegetables are particularly valued for their ability to prevent vitamin C and vitamin A deficiencies, as well as being described as a means of completely eliminating the risk of several diseases, and their consumption has become a global priority (1).

Fruits and vegetables remain sources of nutrient that are very important to the health of man and as such serve as a means of lessening risk of some life-threatening diseases (2). The increase in street vending of fruits and vegetables has drastically increased due to the high demand of these fruits and vegetables by consumers has over time has led to an increase of impact to human health. The number of recorded cases of various foodborne illnesses has increased over time, with many being linked directly to vended fruits and vegetables (3). They are considered perishable and have been connected to epidemiological and microbiological food safety issues (4) due to their diverse preparation methods. Food-borne illness is more severe in many tropical areas surrounding developing countries than in developed countries due to the lack of institutional organizations capable of carrying out food safety awareness programs and policy(s) for street vendors (5).

The knowledge in areas such as; spoilage, pathogenic, exposure to temperatures, transit and indicator organisms which may be present in this produce are very important. There is an assumption that fruits and vegetables do get their natural flora within

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their environment even though it hasn't been proven (6). Enterobacteria, lactic acid bacteria (LAB), *Pseudomonas* and *Erwinia carotovora* are mostly isolated from cucumber. This means that fruits and vegetables are not completely free from microorganisms and its contamination. And as such there is a difference between kinds of normal flora and number of these fruits and vegetables (7).

Furthermore, exposures of fruits and vegetables to high temperatures can be one of the main reasons for the degeneration of some fruits and vegetables during harvest of storage. This investigation of surface microbiota of blueberry fruits exposed to different temperature reveals the presence of microbial contamination on fresh cut vegetables which were kept above 58°C (8). The study recommends that fruits and vegetables be kept below 58°C and not exposed to high temperatures to protect ready to eat fruits from the growth of microorganisms that could be contaminated with spoilage and pathogenic illness (9).

Microorganisms adhere to the surface, attack/ infiltrate fruits and vegetables, and thereby grow within the tissue. Contamination may occur as a result of human handling, transport vehicles, insects, dust, rinse-water, harvesting equipment, temperature exposure, soil, feces, irrigation water, water used to apply fungicides and insecticides, manure, wild and domestic animals (10). Fruits and vegetables are frequently purchased sliced and ready to eat, thus they are typically consumed without washing. Despite the health benefits of fruits and vegetables for a healthy lifestyle, contamination of these fruits added another hardship to customers. According to experts, fruits serve as reservoirs for disease-causing bacteria (11).

Based on this, the present study was conducted to determine the microbial load of these minimally processed fruits and vegetables as well as to address several aspects of hygienic practices, such as preparation skills, handling, storage, place of preparation, storage of leftovers, and ambient temperature (12). As a result of this problem, this study evaluates the hygiene practices of different fruit and vegetable vendors, prevailing temperature around fruits and vegetables, the microorganisms associated with fruits and vegetables. Therefore, this research is of importance as it examines the effect of prevailing temperature on ready to eat fruits and vegetables especially in tropical areas like Bwari town that has not been studied before (13).

It also fills the gap in terms of acquiring knowledge on the peculiarity of different vendors and their ways of handling fruits and vegetables in Bwari town and creates awareness to the role of concerned government officials in the control of microbial contaminants in fruits and vegetables by serving as a reference point for research as it will contribute to the body of knowledge already existing. More importantly, it addressed gaps in previous research by supplying data on the degree of microbial contamination in fruits and vegetables as well as insights into the epidemiological importance of fruits and vegetables.

It is well recognized that poor hygiene standards and poor environmental circumstances facilitate the spread of germs, particularly when handling fruits and vegetables. Poor waste disposal, water pollution, handling, storage, preparation location, storage of leftovers, prevailing temperature, and other factors all contribute to the presence of pathogens in fruits and vegetables (14). Scholars have also focused on the outbreak, assessment and evaluation of microorganisms in fruits and vegetables but little attention has been paid to the effect of prevailing temperature and hygiene practices of vendors on the incidence of pathogens in fruit and vegetables in tropical Bwari town. Hence, this study will focus on researching the effect of prevailing temperature and hygiene practices of fruits and vegetables vendors in tropical Bwari town.

The primary goal of this research is to investigate and evaluate the impact of ambient temperature, different fruit and vegetable vendors' handling procedures, and microorganisms associated with ready-to-eat fruits and vegetables on contamination levels. The study's objectives are to examine the sanitary practices of various fruit and vegetable merchants, identify the effect of prevailing temperature around fruits and vegetables and examine the microorganisms associated with fruits and vegetables and its contamination level.

## METHODS

### Study Area

This study was conducted using a descriptive cross-sectional design. The study hypothesized the number of microbial colonizers on the surfaces of fruits and vegetables sold in Bwari town. The study population consists of fruit merchants in Bwari, Abuja. This study was carried out in the Bwari Area Council of the Federal Capital Territory (F.C.T.) Abuja. It is located in the north-east portion of the Federal Capital Territory, with coordinates 9°16'60" N and 7°22'60" E. As part of a tropical zone, the area has two seasons: rainy and dry. The vegetation is similar to that of the Guinea Savannah, with August seeing the biggest rainfall peak (15). The dry season runs from November to March, while the wet season runs from April to October. Bwari Town experiences typical temperatures between 59°F and 93°F, with unusual excursions beyond 100°F. While

the dry season is hot and partially dry, the wet season typically has warmer temperatures.

### Study Population and Sample Collection

A total of 200 samples of fresh fruits (50 oranges, 50 watermelons) and fresh vegetables (50 carrots, 50 cucumbers) were obtained from three different fruit vendors in Bwari town. The sampling sites were visited between May and June, and samples were collected during that time. All samples were collected and placed in separate white polythene bags to differentiate them based on the location or vendor from whence they were purchased, before being transported to the Applied Microbiology Laboratory Unit at Veritas University for bacterial analysis.

### Study Instrument

The instrument used to collect data and ascertain the hygiene practices of the vendors were the structured questionnaire ascertained by the supervisor in the department of biological sciences allotted to the researcher. This was to ensure that the items in the questionnaire can elicit the intended information. This was a test technique and the essence is to ascertain the strength and weakness of the instrument. Furthermore, to get the prevailing temperature of exposed fruits and vegetables, a handheld thermometer was used to take daily prevailing temperatures where vendors expose their fruits and vegetables in tropical Bwari town.

### Materials and Data Collection

The instrument was self-administered on face-to-face basis to the fruit and vegetable vendors. The questionnaire was correctly filled after physical observations were made on the vendors and the environment by the researcher.

The fruit and vegetable dealers were personally given the instrument in person. Following the researcher's physical observations of the vendors and surroundings, the questionnaire was completed accurately. A weighing balance, beakers, conical flasks, test tubes, autoclave, petri dishes, aluminum foil, wire loops, incubators, blender, nutrition agar, potato dextrose agar, and peptone water are among the supplies and equipment that were used in this study.

The measurement standards were based on the laboratory standards such as room temperature and conditions where the fruits were collected and tested under these conditions. The research variables include; handling of the fruits and vegetables with 20% of the vendors washing their hands before handling fruits, prevailing temperature below 58°C, 90% had hygiene practices.

The handheld thermometer was placed around the stands where fruits and vegetables were sold to observe daily prevailing temperatures where vendors operate. A sample of 20 vendors stand were visited and temperatures recorded accordingly.

### Procedures for Data Analysis

The raw scores were gathered, organized and analyzed and the manual techniques were used to compute the data leading to the production of frequency count tables, cumulative percentages and a histogram.

Laboratory techniques such as serial dilution, biochemical test, plate inoculation and culture technique were conducted on the fruit and vegetable samples, temperature reading was done to determine the prevailing temperature using a handheld thermometer, Physical observations were used to collect temperature readings from the handheld thermometer and recorded in a tabular form and the scores from the questionnaire and the outcomes of the laboratory investigation were analyzed using the descriptive statistics with the Microsoft Excel sheet being the software used.

## RESULTS

The data on the evaluation of microorganisms and hygiene practices of different fruit and vegetable vendors in Bwari town were analyzed using descriptive statistics, laboratory techniques and physical observations. The results were presented in form of tables and figures.

**Figure 1. A Pure Culture from Watermelon**

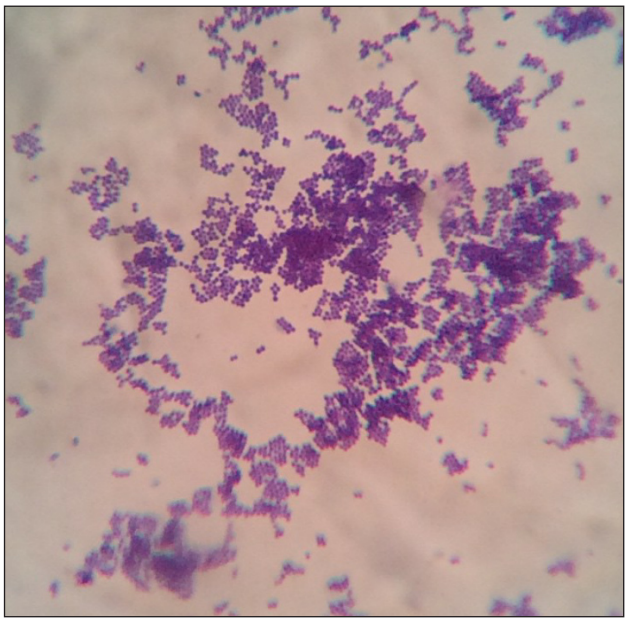

**Figure 2. Gram Positive Cocci**

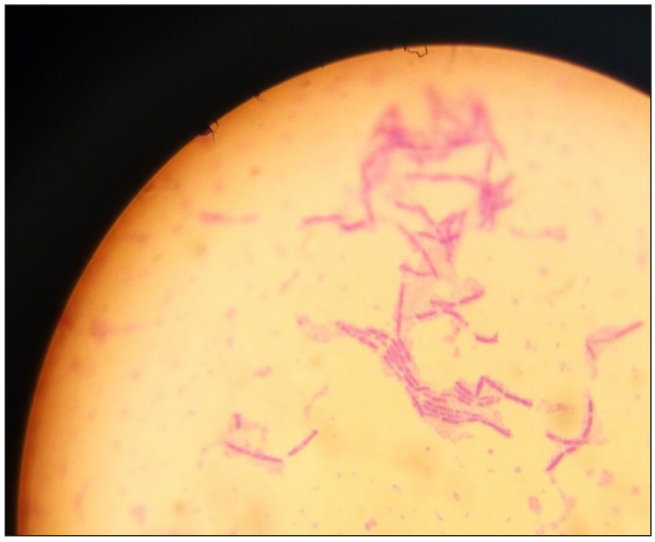

**Figure 3. Gram Negative Bacilli**

The hygiene practices of the fruit and vegetable vendors are shown in Table 1. About 70% had presentable clothes, 20% washed their hands before handling fruits, 90% had clean short nails, 90% blew air into the polythene bag, none removed dirt by blowing, 100% removed dirt by means of clothes.

**Table 1. Food Hygiene Practices of the Fruit and Vegetable Vendors**

| Hygiene practices | Yes | No |
|---|---|---|
| Are their clothes clean and presentable? | 70 | 30 |
| Are their hands washed before handling fruits? | 20 | 80 |
| Does the fruit handler have a clean short nail? | 90 | 10 |
| Does the fruit handler blow air into the polythene bag before use? | 90 | 10 |
| Is dirt or dust on fruit removed by blowing? | 0 | 100 |
| Is dirt or dust removed by means of clothes or bare hands | 100 | 0 |

The hygiene conditions of the environment are shown in Table 2. 70% had clean environment, 80% had adequate handwashing facilities and 50% used new polythene bags to package bought fruits. This lustrates the conditions of the environment and how many vendors actually practices good hygiene and environmental sanitation.

**Table 2. Hygiene Conditions of the Environment**

| Hygiene Conditions | Yes | No |
|---|---|---|
| Is the environment clean from rubbish and toilet facilities? | 70 | 30 |
| Are adequate hand washing facilities available? | 80 | 20 |
| Are new polythene bags used to package bought fruits? | 50 | 50 |

Table 3 shows the result of the recorded temperature values for the exposed fruits and vegetables sampled revealed that, vendors in the study area exposes their fruits and vegetables to temperatures higher than the World Health Organization's standard for exposure of fruits and vegetables.

**Table 3. Temperature Readings for observed fruit and vegetable vendors stand in Bwari town**

| Range | Temperature reading | Remark (0-12.77°C) (32-55°F) |
|---|---|---|
| 1-5 | $25.7^0$-$30.4^0$ | Above WHO standard |
| 6-10 | $24.6^0$-$32.7^0$ | Above WHO standard |
| 11-15 | $25.5^0$-$31^0$ | Above WHO standard |
| 16-20 | $20.9^0$-$28.5^0$ | Above WHO standard |

Table 4 shows samples from Bwari town market that watermelon had the highest average total bacterial count of 8.3 $\times 10^5$, followed by cucumber, 5.4 $\times 10^5$, while Carrot had the lowest, 2.3 $\times 10^5$.

**Table 4. Microbial Load of Vended Fruit and Vegetable Samples in Bwari Town (cfuml$^{-1}$)**

| Samples | Vendors | Bacterial Count | Average |
|---|---|---|---|
| Orange (sliced) | A | 3.1 x $10^5$ | 3.7 x $10^5$ |
| | B | 4.2 x $10^5$ | |
| Watermelon (sliced) | A | 7.6 x $10^5$ | 8.3 x $10^5$ |
| | B | 8.9 x $10^5$ | |
| Cucumber | A | 5.2 x $10^5$ | 5.4 x $10^5$ |
| | B | 5.5 x $10^5$ | |
| Carrot | A | 1.1 x $10^5$ | 2.3 x $10^5$ |
| | B | 4.4 x $10^5$ | |

Table 5 reveals that a total of seven microorganisms were recovered based on the physical and biochemical traits of the isolates from the sample of sold fruits and vegetables. Five bacterial isolates were among them, including *Salmonella species*, *Bacillus species*, *Pseudomonas species*, *Escherichia coli*, and *Staphylococcus aureus*. With the exception of *Bacillus species*, which are gram-positive rods, and

**Table 5. Morphological and Biochemical Characteristics of Isolates From Samples from Bwari**

| Morphological Appearance of Fruits and Vegetables | Cellshape | Gram Reaction | Catalase | Coagulase | Oxidase | Indole | Motiliy | Probable Microorganism |
|---|---|---|---|---|---|---|---|---|
| **Orange(sliced)** | | | | | | | | |
| Milky raised and circular | Rod | + | + | - | + | - | + | *Bacillus species* |
| Pale white with black edges | Rod | - | + | + | - | - | + | *Salmonella species* |
| **Watermelon** | | | | | | | | |
| Creamy, flat and circular | Rod | - | + | - | + | + | + | *Pseudomonas species* |
| Metallic green sheen | Rod | - | + | + | - | + | + | *Escherichia coli* |
| **Cucumber** | | | | | | | | |
| Yellow, flat and circular | Cocci | + | + | + | + | - | - | *Staphylococcus Aureus* |
| Milky, raised and circular | - | + | + | - | + | - | + | *Bacillus species* |
| **Carrot** | | | | | | | | |
| Yellow, flat and circular | Cocci | + | + | + | + | - | - | *Staphylococcus Aureus* |
| Metallic green sheen | Rod | - | + | + | - | + | + | *Escherichia coli* |

**Table 6. Percentage Occurrence of Bacterial Isolates in Fruits and Vegetables**

| Samples | n | Location | *Escherichia coli* Species (%) | *Pseudomonas* Species (%) | *Salmonella* Species (%) | *Bacillus* Species (%) | *Staphylococcus aureus* Species (%) |
|---|---|---|---|---|---|---|---|
| Orange | 50 | Bwari | 0 (0) | 0 (0) | 19 (38) | 41 (82) | 0 (0) |
| Watermelon | 50 | Bwari | 10 (20) | 11 (22) | 0 (0) | 0 (0) | 21 (42) |
| Carrot | 50 | Bwari | 48 (96) | 0 (0) | 0 (0) | 0 (0) | 14 (28) |
| Cucumber | 50 | Bwari | 10 (20) | 0 (0) | 0 (0) | 10 (20) | 30 (60) |

*Staphylococcus aureus*, which is shaped like a gram-positive coccus, all of the bacterial isolates are negative rods. Furthermore, all three bacterial isolates are coagulase positive, with the exception of Pseudomonas and Bacillus species, which are coagulase negative. All of the bacterial isolates are catalase positive.

Table 6. Percentage occurrence of bacterial isolates from Bwari in orange is (82%) *Bacillus species*, followed by *Salmonella species* (38%), with *Escherichia coli*, *Pseudomonas species* and *Staphylococcus aureus* which are null, watermelon *Staphylococcus aureus* (42%) followed by *Pseudomonas species* (22%), *Escherichia coli* (20%) and *Salmonella* having none.

## DISCUSSION

The study revealed that about 80% of the vendors never washed their hands before handling the fruits or vegetables while only 20% of the vendors did. Our results support previous research results which highlighted the parasitological prevalence of some fruits and vegetables that are frequently offered for sale in retail establishments in Cameroon's Mfoundi Division (16-17). This is because most vendors in Bwari town had no formal education which could be the reason why they lacked of proper basic hygiene practices.

Furthermore, the vendors involved in the sales of fruits and vegetables are not fully aware of the risk of microorganisms affecting their product this is because of their lack of education (18). Also, the local government area monitoring and surveillance team are not performing their role in terms of environmental monitoring or sanitation surveillance to keep abreast the surveillance activity expected for vendors of fruits and vegetables in Bwari community hence, the neglect for proper hygiene among vendors of fruits and vegetables. There is a need to raise awareness among the general people, who are unaware that some of these products may be contaminated as a result of improper vendor treatment.

All of the bacteria isolates linked to Bwari town's ready-to-eat fruits and vegetables include *Salmonella species*, *Bacillus species*, *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas species*. These bacteria may be present due to insufficient water, unhygienic vendor practices, or unfavorable environmental conditions (19).

Some of the bacteria found in this study might also be present in the naturally occurring flora of fruits and vegetables, or they could be pollutants from the environment, soil, irrigation water, unusual temperatures, transit, or processor handling just like in previous research (20-21) had similar results. *Staphylococcus aureus* is a normal flora of the skin in man which could be passed through handling, *Escherichia coli* is a faecal contaminants which is from rinsing water and is associated with poor sanitary practices, *Pseudomonas species* are environmental contaminants from soil, skin, plant whose presence can be from handling, packaging or soil, *Salmonella species* are also faecal contaminants from water and hands or poor hygiene and *Bacillus species* is a contaminant from the soil that is capable of causing foodborne illnesses.

Essentially, most of these bacteria discovered in this study are being contaminated under abnormal temperature and therefore, their propagation is being enhanced because the vendors tend to operate or sell their fruits and vegetables under abnormal temperature as discovered in this study (22). Scientifically, temperature is a propagator of microorganisms because certain temperature presents a convenient and thriving environment for these microorganisms and hence, the growth of microorganisms in these fruits and vegetables (23). Also, consumers who are not aware of the effect of temperature on microorganisms will also be vulnerable when they purchase these fruits and vegetables at this particular time of the day. This is a high risk for public health, as risk are spread and diseases are inevitable (24). For instance, how many consumers tends to check the effect of temperature of the fruits they bought? the probability of it being none of them would be high as most of them are less concerned and even end up consuming the fruits and vegetables on the point of purchase such as banana, apple, cucumber, watermelon without thinking of the mechanisms of spread of microorganisms on the fruits and vegetables they have purchased.

This study has revealed that exposure to abnormal temperature propagates the incidence of microorganisms in fruits and vegetables and this is in accordance with the previous research (25-26). Hence, exposure to abnormal temperature of fruits and vegetables should be limited by the surveillance and monitoring team in the local community because Bwari is located in the area where tropical temperature favours the propagation of microorganism's activity. This temperature in the tropics as an environmental condition affects every human activity, especially as this study revealed it in fruits and vegetables. In this previous study it was argued that temperature as an environmental condition can increase relative humidity and improve the condition for microbial growth even in fruits and vegetables such as *Escherichia coli, Salmonella* species can thrive in such a condition (27).

The differences observed in the microbial load of fruits and vegetables from various vendors, indicates that their handling processes led to the high amount of microbial contamination. The high bacteria count obtained here is similar to those obtained from other researches in Nigeria (28) this shows that these samples though high, had no signs of spoilage. Furthermore, watermelon having the highest and most occurring microbial load in all locations is as a result of its high-water content.

It was in the previous research that foodborne illnesses are very common in developing countries, this is because of the way and manner fruits are been handled (29). This study is an example of the poor handling of fruits and vegetables that could arise in the spread of foodborne illnesses in tropical area unless adequate environmental and public health measures are taken as illustrated in Table 1. In the Bwari community, there are a number of practices related to handling and even consuming fruits and vegetables that carry a risk to the environment and general public health. This risk factors can aid pathogenic spread among population especially the risk factors of the non-utilization of personal protective equipment by the fruits and vegetables handlers (30). The sellers poor waste and management practices are discovered and revealed in this study because the remains of these fruits and vegetables are dumped by the roadside and this constitutes serious risk of the spread and growth of microorganism in the area.

Microorganisms in fruits and vegetables are a direct reflection of the water's sanitary condition, harvesting method, transportation process, food storage, and processing (31-32). Hence, environmental, social, and public health disruptions are inevitable as it concerns food safety issues, environmental and social health in Bwari community (33). This means that risk of contamination of both soil, water, animal lives and plant lives are inevitable from the fact that majority of the vendors operate their businesses in different locations of the town from motor parks, road junctions, markets, schools, health centres and even hawkers. And as such may not have adequate infrastructures or nearness to a water supply as this is the case on Table 2.

Today, the risk of antimicrobial resistance in human is an important public health issue because several individuals have been detected with antibiotic resistance illnesses in recent times (34). This activities therefore, needs to be checked by the local environmental and public health surveillance and monitoring team to stem the tide of spread of survey of the community, microorganisms among the population. For example, during survey of the community food remains are left by the road side to decompose on their own and not just decomposing, rodents and other animals come to scavenge on these fruits and vegetables and a lot of bacteria activity are ongoing that can actually spread from one point to another. There were also cases of contact by young children on this remains of fruits and vegetables that are deposited as waste by the roadside (35). Some of this open dumping practiced during the rainy season are very harmful as the remains are washed into drainages and streams increasing the microbial load of the environment.

Poor waste handling practices can pose serious social, environmental and public health problem (36) as

it can result to ambient air pollution as a result of odor from the waste remains or decomposed litter of fruits and vegetables around the environment releases obnoxious fumes especially when exposed to water and heat.

The public health consequences of the prevalence of these microorganisms could lead to pathogens spills into drainage systems, water systems, soil and even work acquired infections by the vendors and consumers (37). These pathogens are partly responsible for most common ailment among the population leading to either severe and fatal health outcomes with symptoms like; fever, headache, nausea, vomiting, abdominal cramps or pain and even diarrhoea. Children, infants and aged are the most vulnerable (38). This implies that a lot of health risk arises from abnormal exposure of fruits and vegetables to high temperatures, poor hygiene practices and presence of microorganisms.

Considering the environmental, social and public health at risk from vendors activities handling fruits and vegetables in Bwari community, it is expected that all vendors should adopt and put in place life security measures on their activities especially in the use of personal protective equipment, upgrade their hygiene practices, they should also undergo training and skills on hygiene practices in terms of fruits and vegetables. Local government community health workers should be empowered to monitor and improve surveillance of their activities for the effectiveness of such measures, in this way, the issues of disease risks and outbreak of infections like *Escherichia coli, Salmonella Species* and other microorganisms would be controlled within the community (39). Similarly, it is essential to engage in other public awareness programs to educate the general public about the risk and spread of foodborne diseases associated with the consumption of ready-to-eat fruits and vegetables, as many people are unaware of the risk of consuming ready-to-eat fruits and vegetables from vendors (40).

Finally, the local government authority should as a form of policy take decisions on proper hygiene for all vendors of fruits and vegetables in the area to enhance coordinated actions in the prevention and control of disease spread to achieve SDGs in health and environment.

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## AUTHORS' CONTRIBUTION

Conceptualization: COE; Writing-original draft: COE; Data curation: ANR; Methodology: ANR; Investigation: COE; Research design: ANR; Resources: COE; Formal analysis COE; Project administration: COE and ANR; Visualization: COE and ANR; Writing-review and editing: ANR; Validation: COE and ANR; Software ANR; Supervision COE.

## CONCLUSION

The study's findings demonstrated that Bwari town's ready-to-eat fruits and vegetables were tainted to varying degrees by bacteria, including *Salmonella*, *Bacillus*, *Pseudomonas*, *Staphylococcus*, and *Escherichia coli*. Fruits and vegetables were also contaminated through handling, packaging, storage, transportation, poor hygiene practices and exposure to high temperature in the area.

This study also provided an insight into the quality of fruits and vegetables in Bwari town and established a significant relationship between high temperature, prevalence of microorganisms and hygiene practices among fruits and vegetable vendors.

It was determined that, when exposed to environmental conditions above 58 degrees Celsius, the effect of the prevailing temperature was one of the determinants of pathogens in fruits and vegetables. Moreover, the handling practices of various fruit and vegetable vendors were found to be factors influencing the presence of pathogens in fruits and vegetables. This calls for enhanced public health awareness campaigns, improved policies regarding the vending of fruits and vegetables, and higher cleanliness standards.

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