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Article

Knowledge Level of Street Fruit Vendors on Food Hygiene in the Tamale Metropolis

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Abstract: This study aimed to assess the knowledge level of street food vendors on hygiene in the Tamale metropolis in the Northern Region of Ghana. The study employed the health belief model as the theoretical basis. Quantitatively, the study employed a descriptive cross-sectional study design to examine the microbial load of street-cut fruits and assess the knowledge and practice of vendors of cut fruits on personal and food hygiene in the study setting. The population consists of cut and vented pawpaw, watermelon, and street fruit vendors registered with the health directorate in the Tamale Metropolis. A convenient sampling technique was used to select 113 respondents for the study. The Yamane formula was used to determine the sample size to select one hundred and thirteen participants (113) out of one hundred and fifty-eight street fruit vendors in the Tamale Metropolis. The main instrument for data collection was a questionnaire. A questionnaire had close-ended questions which were developed using a 'Yes' and 'No' response, and a four-point Likert-type scale ranging from 1=Strongly Disagree (SD), 2=Disagree (D), 3=Agree (A) and 4= Strongly Agree (SA). The data were analysed using descriptive statistics (frequency, percentages, means and standard deviation). The findings revealed that the overall knowledge level of respondents is low. The findings also indicate that vendors do not control the rate at which their customers touch their vended fruits. It is recommended that Street fruit vendors and handlers be educated on fruit hygiene practices through engagement by the Health Directorate Unit of Tamale Metropolis and the Ministry of Health. To keep consumers safe, the Tamale Metropolitan Assembly must strictly enforce compliance with regulations on operation permits and health clearance certificates. Metropolitan sanitation officers must regularly monitor fruit vendors to ensure compliance with goods.

Keywords: Knowledge, Street, Fruit, Vendors

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1. Introduction

There is a global increase in demand for and dependence on street foods, including fruits. Street foods are well-patronised in many developing countries because they are affordable and accessible [1]. They also serve as an important source of nutrients for the people and income for the vendors. Studies revealed that approximately 2.5 billion people eat street food daily, supporting the livelihood of millions of low-income people and making a significant economic contribution. Street food also offers a convenient diet for many people in developing countries [1, 2]. There have been international and local rules and guidelines by the World Health Organisation (WHO) and Food and Drugs Authority (FDA) to ensure food hygiene because of the significant role that street foods play in people's lives [1, 3, 4]. Since they retain regional eating customs, cultural traditions, and social legacy, food served on the streets is essential to a nation's cuisine. They provide the sellers with a source of revenue and other people with jobs. Studies pointed out that consumers value street meals highly due to their flavour, accessibility, affordability,

cultural and social legacy link, and nutritional value. These enormous advantages cannot be ignored globally [5, 6].

Similarly, another study found that customers' food safety knowledge and attitudes are affected by their age, sex, income, and level of education at street food vendors. The probability of having strong knowledge was greater in educated street food operators than in those without education. It was also discovered that the older the vendor, the more they know about keeping their food safe. People above 45 had lower odds of learning about food hygiene than those under that age [7].

Research indicates that the knowledge levels, practices and attitudes of most of the street food vendors essentially do not meet proper hygienic standards and can, therefore, lead to consumers of street foods eating unsafe food, which in effect can cause morbidity and mortality due to foodborne diseases which can have concomitant effects on trade and development [8]. The educational level of fruit vendors is perceived to be low. Some people also perceive that most people with low educational levels may not know much about the possible health implications of some practices that may compromise street foods' safety. Despite regulations, improvement in food safety systems has not been fully realised, and this is observed in recent reports of foodborne illness and/or contamination of street foods with enteric bacteria in various parts of the country [8]. Several outbreaks have recently been reported in Ghana. Four persons died in Sheho (Upper East Region of Ghana) after eating contaminated meat. They also reported a cholera outbreak after eating contaminated food in Atebubu (Bono East Region), which claimed nine lives. In contrast, another such outbreak resulted in the death of one person in Obuasi (Ashanti Region) and the hospitalisation of over 50 [9]. Thus, the knowledge levels, practices and attitudes of most of the street food vendors essentially do not meet proper hygienic standards and can, therefore, lead to consumers of street foods eating unsafe food, which in effect can cause morbidity and mortality due to foodborne illnesses, and concomitant effects on trade and development [8].

All prospective consumers are vulnerable to food poisoning due to the proliferation of street food vending, which has increased risk factors such as poor and unclean food handling [10]. According to some estimates, eating tainted street food is linked to as many as 70% of cases of diarrheal sickness in underdeveloped countries [11]. Fresh-cut fruits have been related to foodborne illness epidemics in industrialised and developing nations [12]. Similarly, research in Nigeria concluded that fresh-cut fruits from all six states in Nigeria are contaminated with several enteric bacterial species [13]. The prevalence of unsanitary practises among Ghana's street food vendors has been attributed, in part, to a lack of regulation and enforcement of bylaws governing street food vending by local authorities and inefficiency or absence of education and training of food vendors on health and hygiene [1].

Most street food vendors' knowledge levels, practices and attitudes do not meet proper hygienic standards. They can, therefore, lead to consumers of street foods eating unsafe food, which in effect can cause morbidity and mortality due to foodborne diseases and concomitant impact on trade and development [8]. Investigations must establish facts on street fruit safety to inform policy and education of citizens who engage in food vending to prevent the future spread of foodborne diseases. This study aimed to assess the knowledge level of street food vendors on hygiene in the Tamale metropolis in the Northern Region of Ghana. They sought to answer the research question - What is the knowledge level of street fruit vendors on food hygiene in the Tamale metropolis?

1.1. Concept of Street Food Vending

Street vendor foods are "foods and beverages prepared and/or sold by vendors in streets and other public places for immediate consumption or consumption at a later time without further processing or preparation." Vending street food is typical in major cities worldwide, including Bangkok and Mexico City [14]. You will find a concentration of food

vendors selling street fare near metropolitan workplaces, educational institutions, healthcare facilities, transportation hubs, bus and train stations, and taxi stands. Even though it is a major contributor to the country's economy regarding jobs and food sales, relatively little is known about South African street cuisine or the habits of the people who eat there [15].

1.2. Theoretical Review - The Health Belief Model

The study employed the health belief model as the theoretical basis. The health belief model is a flexible framework for promoting actions for disease prevention and good health. In order to comprehend why individuals do not employ disease-preventive methods and technologies for early illness identification and prevention, scientists in the United States created the Health Belief Model [16]. The Health Belief Model examines the range of individual beliefs influencing one's desire to adopt a healthy habit. The preconceived notions include perceived vulnerability, perceived seriousness, perceived advantages, and perceived obstacles. While perceived severity relates to views of the condition's potential seriousness, perceived susceptibility refers to the impression of a condition's susceptibility. The term "perceived benefits" refers to the value or benefit that altering one's conduct is seen to have. Any obstructions or hurdles to the behavioural changes being considered to reduce risk are referred to as perceived barriers.

The theory has been used for the investigation because the practices of the sellers before the customer even gets the fruits for eating have a significant role in the degree of microbial load on cut fruits. Vendors that follow hygiene best practices can reduce the microbial burden. The model works because the seller will know the procedures to follow and respond accordingly if they believe (perceive) that the fruits supplied at the sales point are microbially contaminated. This is shown by the study's measurement of the sellers' understanding of fruit-borne illnesses and how they spread. Knowledge will have an impact on practice. The model also shows the perceived harshness in a different aspect. The perceived severity is explored in the context of this investigation about vendors' awareness of fruit-borne illness symptoms. Vendors are more likely to follow good hygiene practices when they believe these fruit-borne illnesses are severe. The perceived advantages and obstacles are the only elements that are not the subject of this investigation. This is not a constraint since the research strongly focuses on information that will be translated into practice to lower the microbial burden.

Although the theory has been criticised for emphasising healthy conduct, it applies to this research since it does not concentrate on the social and economic factors that may or may not cause vendors to follow sanitary practices. The study's concern is microbial load, which can lead to foodborne disease.

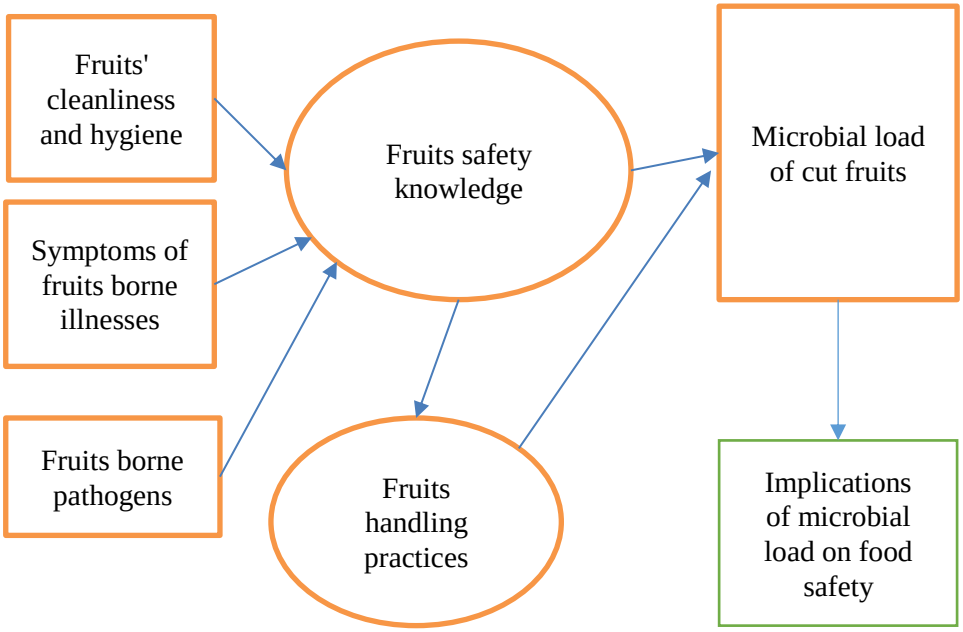

Figure 1. Conceptual Framework on Implications of microbial load of selected cut fruits on food safety Adapted from [17]

The sudy adopted a conceptual framework developed by Woh, Thong, Behnke and Lewis, as indicated in Figure 1. The framework shows the relationship between the level of knowledge of the street fruit vendors on food cleanliness and their food handling practices, whitch could lead to microbial load in the sample fruits. The study assessed the level of knowledge of the street fruit vendors on food cleanliness, symptoms of foodborne pathogens, and their knowledge of foodborne pathogens as indicated in the conceptual framework. The study also assessed food handling practices among the respondents, as indicated in the framework. The components are explained as follows;

Fruit safety knowledge: Knowledge of street fruit vendors significantly influences fruit safety, as most are unlicensed and are not trained in fruit hygiene and sanitation. The conceptual framework examines knowledge of the street fruit vendors in three areas: fruit cleanliness and hygiene, symptoms of fruit-borne illness, and knowledge of fruit-borne pathogens. As indicated in the framework, the knowledge of the street fruit vendor can inform how he/she will handle the fruits, hence the microbial load [18].

Fruits handling practices: The framework examines fruit handling practices among street fruit vendors because the unwholesome handling of fruits may increase the risk of contamination and hence cause diseases to those who buy and eat them [18]. The framework indicates that fruit handling practices also inform the fruits' microbial load level.

Microbial load: Many studies have reported that cut street fruits are an appropriate medium to transmit antimicrobial-resistant pathogenic bacteria [18]. The framework shows that the level could inform the microbial load of freshly Cut Street fruits of knowledge of the street fruits vendors and the manner of handling of the fruits. The hands, hair, nose, and mouth harbour microorganisms that can be transferred to the food during processing, packaging, preparation, and service by touching, breathing, coughing and sneezing; uneducated vendors who sell these fruits display or hawk them on the streets in contaminated containers, utensils, or dirty environments [19].

1.3. Knowledge Level on Food Hygiene of Street Food

According to research, most vendors selling food on the street are uninformed about proper food hygiene procedures, making this a significant subject for public health advocates to address [20, 21]. Studies estimate that roughly 2.5 billion individuals throughout the globe eat street food regularly without enough training in food hygiene [22, 23]. The low prices and easy availability of street food are two of the main reasons for its popularity, particularly in economically depressed places [3]. In addition, the firm may be run with fewer resources and provide food and nutrition for customers and jobs for city dwellers [24]. Several empirical studies have evaluated the knowledge of street food sellers with mixed results. Research on the evaluation of food selling on the streets of Ghana revealed that roughly 78% of participants had a solid understanding of food hygiene. Because of their limited education, most street food sellers have little expertise in ensuring the quality and safety of the food they sell [25].

In other contexts, when experts are supposed to share what they know, they often settle for mediocrity since customers don't insist on it. The food safety awareness of street food sellers was shown to be related to socio-demographic variables such as age, sex, and socioeconomic level [26]. A similar study posits that food vendors on the street tend to have less formal education than those in the food service industry; there is no correlation between their education level and food hygiene expertise [27].

Studies conducted worldwide have shown that street food sellers have always been an easy target for criminals. Therefore, those who operate in the street food industry must be well-versed in the best practices that guarantee the safety of their customers at all times [28]. The authors found that the clients are vulnerable to all sorts of food safety issues due to the lack of understanding of street food sellers on basic practises. Due to their availability throughout the clock, street vendors play an important role in ensuring the public's access to a wide variety of safe foods [29].

In addition, understanding industry norms is important for street food vendors because of the increased scrutiny that comes with operating in a high-traffic area frequented by a diverse range of customers (from locals to tourists) [30]. In addition, it is increasingly difficult for street sellers to tell their real from counterfeit goods or identify consumers who may pose a security risk to them [31]. Street sellers in the African environment typically don't comply with food safety problems since they don't know enough about them. The designs and configurations of street food sellers are not focused on food safety, making it exceedingly challenging to guarantee optimum food safety security operations [32].

An empirical study found that vendors on the street do not have the knowledge to meet regulatory requirements. The results showed that most people do not know how to best ensure cleanliness and value for money. Researchers observed that street food vendors were often uninformed about fundamental food safety practices [28]. Similar findings discovered that most street food vendors lacked the knowledge to follow proper food safety procedures [29]. Research participants were not well-versed in the importance that customers put on cleanliness. In addition, the data showed that most survey respondents didn't have a solid grasp on why keeping food clean is so important. From the advent of taverns till the present day, vendors of street food have taken the rap for customers becoming sick due to poor hygiene. When asked whether they had ever heard anything about food hygiene from the media or government, the great majority of Ghanaian street food vendors replied they had. The majority of vendors surveyed wore aprons when making and serving customers food, although some also covered their faces with scarves and washed their hands thoroughly after using the restroom [25].

Researchers discovered that street sellers were also well-versed in food hygiene practices in Vietnam. The vast majority of participants in the research were careful to avoid any potential dangers [33]. Similarly, media outlets were cited by street food sellers

as key informants on food safety practices. According to the results, most respondents understand what makes food safe [25]. However, an evaluation of research on food safety and hygiene in Ghana found that more than 80% of street food operators had little awareness of food hygiene practices. According to the survey results, most workers were not washing their utensils with soap. Three-quarters of respondents did not give their clean bowls a last rinsing in warm water, and almost a quarter (23.8%) never dried their dishes with a clean towel. The research also showed that almost half of the employees included in the study never took a proper shower before working with the public. This has happened because so many of them have made the market their bed. It was also found that most volunteers never had a medical examination before being given access to the meals. However, the research found that none of the subjects had visible skin lesions when unclothed [3].

From the standpoint of persons utilising appropriate service supply to consumers and using zero tolerance to surpass customers' expectations, merchants on the street know what elements influence their motivation to execute the standard practices [34]. To increase and improve customer satisfaction, workers at street food sellers need the skills to distinguish between customers' expectations and the service they get [35]. Customers' familiarity with a location's street food sellers has also been an important factor in decision-making. The desire to be shielded from harm is often their primary concern [36]. However, owing in large part to individuals and personnel having poor awareness about food safety ideas, the street food sellers sector is very susceptible in terms of safety [29]. Researchers have shown that dirty utensils are a common source of danger in the home [35]. However, this has burdened street food sellers to maintain high-quality standards and provide efficient procedures to prevent or lessen the adverse effects on individuals, businesses, and society [31].

Safeguarding national health, boosting tourism and international trade, and producing, distributing, and consuming safe food are all ways street food vendors' knowledge of food safety can contribute to nations' economic and health development [14, 15]. An increasing number of street food sellers are in developing nations. Despite the significance of food safety, there seem to be few quality control mechanisms in place to safeguard customers from food-related diseases [15, 37].

2. Materials and Methods

Quantitatively, the study employed a descriptive cross-sectional study design to examine the microbial load of street-cut fruits and assess the knowledge and practice of vendors of cut fruits on personal and food hygiene in the study setting. The study considered using a descriptive cross-sectional study design because it was practical to implement and relatively low cost compared to other designs [3]. The population consists of cut and vented pawpaw and watermelon and street fruit vendors who have registered with the health directorate in the Tamale Metropolis. A convenient sampling technique was used to select 113 respondents for the study. The Yamane formula was used to determine the sample size to select one hundred and thirteen participants (113) out of one hundred and fifty-eight street fruit vendors in the Tamale Metropolis. The main instrument for data collection was a questionnaire. A questionnaire had close-ended questions which were developed using a 'Yes' and 'No' response, and a four-point Likert-type scale ranging from 1=Strongly Disagree (SD), 2=Disagree (D), 3=Agree (A) and 4= Strongly Agree (SA). On this scale, the highest mean possible was 2.50, and the lowest mean possible was 1.00. The study employed the use of a questionnaire to provide a means for collecting data whose analysis was to help answer the research question. The data were analysed using descriptive statistics (frequency, percentages, means and standard deviation).

3. Results and Discussion on the Knowledge level of street vendors on fruits and personal hygiene, pathogens transmission, and symptoms of fruit-borne diseases

The study assessed street vendors' knowledge of food hygiene and its practice. Tables 1, 2, and 3 present the findings on what respondents know about the best way to maintain food and personal hygiene in food handling and some effects of poor hygiene practices. This was to check whether they practised what they knew or did what was convenient for them.

Table 1. Respondents knowledge on fruit safety and personal hygiene

Statement	Mean	SD
Always wash your hands after coughing or sneezing	2.72	0.99
It is not enough just by washing hands under running water to remove bacteria before touching fruit	1.90	1.37
Exposing hair to fruit can cause fruit-borne disease	1.63	0.67
Avoid bare-hand contact with ready-to-eat fruits	2.02	1.05
The best way to avoid fruit poisoning is to wash them under running water.	2.00	1.04
Always store fruits in the fridge/ basket/tray before cutting.	1.20	0.40
Packaged cut fruits should be carried on trays /transparent plastic containers for hawking	3.00	1.16
Cover the cut fruits while selling.	2.56	1.08
Sell the cut fruits roaming under the sun.	3.06	0.69
Overall, the Knowledge level	**2.23**	**0.94**

1= Very Low, 2= Low, 3= High, 4=Very High; Source: Field survey, (2022)

In Table 1, the overall knowledge of vendors on fruit safety and personal hygiene among the respondents is low (M= 2.23, SD= 0.94). Respondents, however, have high knowledge in promoting food safety and personal hygiene when selling cut fruit while roaming (M=3.06, SD=0.69) and knowledge of packaging cut fruits in plastic containers for hawking (M=3.00, SD= 1.16). All other aspects of knowledge and food safety measurement revealed either a low or very low level.

Table 2. Respondents knowledge on fruit borne pathogens transmission

Statements	Mean	SD
consumers can complain of sickness after the consumption of cut street fruits	2.72	0.99
I know the type of illness people complain of after eating contaminated fruits	2.06	1.00
I know bacteria can be transmitted through reused gloves	3.12	1.00
I know bacteria can be transmitted when buyers touch cut fruits	1.20	0.40
I know bacteria can be transmitted when I talk over fruits during processing	2.06	1.00
Overall, Knowledge of Pathogens transmissions	**2.23**	**0.88**

1= Very Low, 2= Low, 3= High, 4=Very High; Source: Field survey, (2022)

Table 3 presents the respondents' knowledge of fruit-borne pathogens and their transmission. The overall knowledge level of respondents is low (M=2.23, SD=0.88). Although respondents had high knowledge that germs can be transmitted through reused gloves (M=3.12, SD=1.00), the findings of the study reveal a very low-level knowledge of respondents about the transmission of germs or pathogens by buyers touching cut fruits

(M=1.20, SD=0.40). The findings indicate that vendors do not control the rate at which their customers touch their vended fruits. Since eye detection cannot be made to know which customer carries pathogens, this lower knowledge is an open window to pathogen spread.

Table 3. Knowledge of symptoms related to fruit-borne diseases

Statement	Mean	SD
I know stomach pain is a symptom of fruit-borne disease	2.72	0.99
I Know diarrhoea is a symptom of fruit-borne disease	2.04	1.00
I know vomiting is a symptom of fruit-borne disease	3.10	1.00
I know fever is a symptom of fruit-borne disease	1.20	0.40
I know skin rashes are a symptom of fruit-borne disease	1.53	0.50
I know seizure is a symptom of fruit-borne disease	1.20	0.40
Overall knowledge of symptoms related to fruit-borne diseases	**1.97**	**0.72**

1= Very Low, 2= Low, 3= High, 4=Very High; Source: Field survey, (2022)

Table 3 presents the knowledge on symptoms related to fruit-borne diseases. The overall knowledge level of respondents was very low (M=1.97, SD=0.72). Respondents had a high knowledge level in relation to vomiting as a symptom of fruit-borne diseases (M=3.10, SD=1.00). Other symptoms, as measured, either showed a low or very low knowledge level. Since vending fruits in our part of the world is an income-generating activity, and consumers primarily do not consider the conditions under which cut fruits are processed and served before patronising, the vendors do not pay much attention to the nutrient preservation and safety of the food served. Notwithstanding, the benefits we get from fruits could be contaminated if not handled well. Knowledge is a powerful tool that informs practice. It was with this conception that the researcher tried to find out about vendors' knowledge of food safety and personal hygiene.

The findings from the data presented on respondents' knowledge of street fruit safety and personal hygiene indicate that respondents' knowledge level is low. This finding implies that since their knowledge level is low, their fruit safety and personal hygiene practices are little. This finding from the study agrees with a previous study that food vendors in developing countries, including fruit sellers, observed little hygienic practices to safeguard against contamination. Sneezing has the potential to spread microbes through the droplets. For this reason, conscious efforts have to be made to prevent such contamination [15]. The findings on safety practices imply that respondents did very little to protect the consumers from any related health issues regarding food hygiene due to their practices. When respondents said they sneeze without any proper barrier, it simply meant that they did not see the need to ensure the safety of the fruits they offer to consumers who come to buy by their inadequate knowledge and ignorant practice. This suggests that respondents' ignorance of personal and food hygiene could be a potential source of contamination of what they sell to consumers.

Polythene bags, which were the commonly used packages for sliced fruits, are waterproof and chemically resistant. However, the sliced pawpaw and watermelon were still contaminated. Bacteria found in the polythene packaged sliced pawpaw and watermelon could also have been introduced from exposure of sliced watermelon to contaminated environments before they were processed and packaged. Therefore, there is an unmet need for proper treatment to reduce microbial contamination from the fruit samples. Washing is an important step for the decontamination of microbes of any fresh fruits and vegetables in postharvest processing. Running tap water to clean fruit samples before consumption has been a traditional method for centuries. However, washing fruits using tap water can cause cross-contamination, as the safety of the source and its wholesomeness cannot be ascertained. Though it could reduce microbial load, it does not play a significant role in microbial reduction. Results from the present study lead to the

significance of using decontaminating agents when washing fresh produce such as fruits and vegetables. In a study, among the different treatments, vinegar showed the highest microbial load reduction of tested fruits and salad vegetables, whereas washing with sterile water showed the lowest microbial reduction [39].

Additionally, the study found that most participants indicated they cut many of the fruits before packaging and never covered the cut fruits before processing them before selling them. Dust and flies were more likely to settle on these fruits before being sold to consumers. Exposing fruits to the environment could cause them to get contaminated by microbes through the particles, flies, and droplets likely to come from humans around the processing environment. This must be prevented to help reduce the menace it may likely cause consumers. This finding from the study agrees with an earlier study that dust was found to be settling on foods because the foods were not covered at the time of the processing and sometimes during sales [40].

4. Conclusion and Recommendations

The study assessed the knowledge level of street fruit vendors on fruit hygiene in the study setting. The findings revealed that the overall knowledge level of respondents is low. However, respondents knew that germs can be transmitted through reused gloves. The study's findings also revealed a very low level of respondents' knowledge about the transmission of germs or pathogens by buyers touching cut fruits. The findings also indicate that vendors do not control the rate at which their customers touch their vended fruits. Since eye detection cannot be made to know which customer carries pathogens, this lower knowledge is an open window to pathogen spread. The knowledge of symptoms of fruit-borne pathogens diseases was very low.

It is recommended that Street fruit vendors and handlers be educated on fruit hygiene practices through engagement by the Health Directorate Unit of Tamale Metropolis and the Ministry of Health. To keep consumers safe, the Tamale Metropolitan Assembly must strictly enforce compliance with regulations on operation permits and health clearance certificates. Metropolitan sanitation officers must regularly monitor fruit vendors to ensure compliance with goods.

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