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FOOD SCIENCE & TECHNOLOGY | RESEARCH ARTICLE

Food vending safety concerns: Consumer perception on fresh coconut in New Juaben South Municipality of Ghana

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Abstract: This study assessed the perception of consumers on the safety of fresh coconut in the New Juaben South Municipality of Ghana. A study was conducted with 35 coconut vendors and 210 consumers using purposive and accidental sampling techniques. Officials of the municipal food safety regulatory bodies were interviewed to get the institutional regulatory aspects of coconut vending. Descriptive statistics were processed from the survey data. Post-harvest, marketing and servicing activities of coconut vendors were identified as a major threat to food safety in the municipality. High awareness of the health benefits of tender coconut water accounts for its continuous consumption among consumers. A majority (36.2%) of consumers were of the view that vendor operations are likely to result in malaria outbreaks followed by Covid-19 infections (26.2%), cholera (20%) and dysentery (17.6%). Increased awareness through education for vendors and



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PUBLIC INTEREST STATEMENT

Fresh coconut is among the common foods that are sold on the streets in the New Juaben Municipal of the Eastern Region of Ghana. However, some activities of the coconut vendors in recent times posing potential public health threats have become a source of worry to many consumers. These activities identified from this study include post-harvest, marketing and service practices of coconut vendors. Additionally, the outbreak of diseases like malaria, COVID-19, typhoid, dysentery and cholera were perceived by consumers to be the likely major public issues that could arise from these poor food safety practices from vendors. The municipal food safety actors mandated to regulate properly the activities of the coconut sellers, have not been effective in ensuring proper fresh coconut safety handling. This requires an increased awareness creation through education for vendors and consumers because of the cultural significance and health benefits associated with coconut consumption.

consumers and improved regulatory functions are recommended because of the cultural significance and health benefits of coconut consumption.

Subjects: Public Health; Food and Nutrition Science; Public Policy; Food Policy; Environmental Management; Environment and Health

Keywords: Food safety; coconut; health benefits; post-harvest activities; marketing and servicing activities; paring; tender coconut water; coconut vendors

1. Introduction

The world over the past five decades has seen a rise in urban population which is attributed to increasing birth rate and rural-urban migration (Codjoe et al., 2016). Statistics in 2015 indicates that a larger portion of the world's population lives in cities compared to statistics in 1950 and this trend may continue (United Nations, Department of Economics and Social Affairs, 2015).

One of the reasons why people prefer living in cities or embark on rural-urban migration is in search of greener pastures. The majority of these people are women classified as low- to middle-income earners in the country. This increase in population means that there will be increasing food demand and once employment opportunities in the cities are becoming scarce, these women turn to engage in the selling of local foods along the streets. Thus, this becomes their source of livelihood. On the other hand, consumers within the urban areas find street food vendors very helpful in the following ways: (i) it helps to save the time they would have used to cook and (ii) it also helps to reduce their workload by providing affordable local food from food joints (Maxwell et al., 2000; Mensah et al., 2002; World Health Organization, 2006). However, the safety of these street foods has raised serious concerns.

According to the World Health Organization, food safety encompasses the safety of food supplies from microbial, chemical and physical contaminations that may occur all through stages of food production, which includes cultivating, harvesting, processing, transporting, retailing, distributing, storing, preparing and consuming to prevent foodborne diseases. Thus, food consumption is purposed to provide energy and not to cause harm to the consumer. Street food joints sell already made food or beverages to the general public for immediate consumption or to be consumed at a later time by just warming without going through further complicated preparation process (World Health Organization, 2006).

Coconut remains one major cash crop along the coastal belt in Ghana. In recent times, there has been a rise in the consumption of fresh coconut due to its nutritional and medicinal value. Many rural people depend on coconut as their main source of income. The coconut industry employs nearly 762,000 people, both private and public (Abankwah et al., 2010).

1.1. What is food?

It is anything solid or liquid that contains nutrients made up of carbohydrates, fats/oils, proteins, minerals and vitamins, which when ingested, the consumer gains energy for physical growth and development to sustain life-cycle processes. Humans and animals depend on other animals for their survival. Therefore, every living thing derives nourishment from food through metabolism.

1.2. Concept of food systems and their relationship to food security

Food systems embrace activities, resources and structure that collectively determine countries or people's food security status. Food security focuses on three distinct elements, namely, availability (i.e. production, distribution and exchange), accessibility (i.e. affordability, allocation and preference) and utilization (i.e. nutritional value, social value and food safety) which translate into food systems (Ingram et al., 2005; United States Agency for International Development, 1992). Food availability refers to the existence of sufficient food in stocks in the right quality for consumption, which can be influenced by the nature of the transportation network. Food access refers to the

ability to obtain the appropriate measures of food to satisfy all dietary requirements of all individuals of a household. Food utilisation principally refers to the processing of food, storage, cleanness, rate of distribution of food, and the nutritional worth of food in stocks.

2. Production and cultural relevance of coconut in Ghana

2.1. Production and cultural relevance

In Ghana, coconut (*Cocos nucifera*) was first grown at Keta as an estate crop (Wills, 1962), although some people argue that the crop originated from either America (tropical South America and the Antilles), southeast Asian peninsular (probably Malaysia) or South Africa. The crop is said to have reached Ghana by ocean current and through the actions of missionaries in 1912 (Wills, 1962). Currently, coconut is largely cultivated in the Western Region of Ghana as a result of the favourable climatic conditions (Chona & Adansi, 1970).

According to Wills (1962) and Agble (1970), the coconut palm is one of the widest-produced palms in the world. It is grown in the four (4) main coastal regions (Greater Accra, Central, Volta and Western Regions) of Ghana. Production is largely dominated by smallholder farmers with landholdings ranging from 0.5 ha to 5.0 ha. The country records an annual yield of 224 million nuts where smallholder farmers contribute 179 million which is 80% of the total production (Arkhust, 1991). In view of this, the government of Ghana deemed it necessary to support the sector by providing these smallholder farmers with about 80,000 hybrid seedlings, to help improve their yield under a Planting for Export and Rural Development (PERD) initiative.

The palm has many uses. About one-third of the world's population depends on coconut primarily for its health-related benefits and for its nourishment. It is a means of improving the economy for some countries by providing a source of livelihood for its citizens (CRC, 2004). Coconut can be classified under "functional food" because it is rich in minerals, vitamins and fibre. Some of the benefits obtained from coconut may include coconut oil which could contribute to the treatment of atherosclerosis and cholesterol patients (Carandang, 2008). Coconut water also helps with lowering of high blood pressure, reduces oxidative stress and improves antioxidant status (Zulaikhah, 2019). Nutrition information provided by the USDA indicates that for 1 cup (240 g) of 100% coconut water contains 45.6 calories, 0.4 g fat, 252 mg sodium, 8.8 g carbohydrate, 2.6 g fibre, 6.3 g sugars, and 1.8 g protein.

In Ghana, coconut is consumed as a snack on the streets of many communities and cities across the country of which the New Juaben South Municipality of the Eastern Region of Ghana is no exception aside its industrial and culinary use. Coconut consumption forms an integral component of the daily food, life and activity of Ghanaians bringing happiness to diverse people of different levels in society together, emphasizing the cultural relevance of the plant. For instance, the hosting of the maiden International Coconut Festival in 2019 underscores the importance and popularity of coconut in the daily lives of Ghanaians. Fresh coconut remains a common liquid food sold on the streets of the municipality.

2.2. The situation of street vending in Urban Ghana

Rural-urban migration is one of the major characteristics of the cities in Ghana, as well as many sub-Saharan African countries, resulting in high population growth and urbanization in the country. Rural-urban migration is a common phenomenon among the youth. The main aim of these movements from the hinterland to the main centres is to secure a better commercial activity. In the hope of securing better opportunities that could change their standard of living, migrants unfortunately come to face the challenge of limited or no employment opportunities within the formal sector due to their low educational level and inadequate formal skills to get a formal job (Kwankye et al., 2007). About 14% of the population in Ghana are into informal non-agrarian jobs. In many African countries, especially Ghana, South Africa and Kenya, with 88%, 68% and 63%, respectively, of the street, local food vendors are women, although in some countries because of

culture, women are not allowed to engage in any economic activities (ILO & WIEGO, 2013). Street vending is also dominated by women because it requires limited skills, capital and more pronounced flexibility and compatibility with childcare (Mitullah, 2004:5).

According to Kwankye et al. (2007:1), the activities of street vendors are certified by legislative bodies in most countries. However, the lack of operational licensing regimes in Ghana accounts for increasing numbers of street vending businesses. Thus, anybody can just start selling in the streets when he/she feels like doing so. This remains a challenge for both street users and local vendors themselves (Klu n.d:23). Children engage in this street vending business as a way of assisting their parents or as a means of making a living for themselves. Opoku (1998) in Mitullah (2004:6) mentioned that in urban centres especially Accra, where trade activities are very active accounts for 12% of child labour in the country. A typical street trade business starts around 4:30 am to 9 am and closes around 5:30 p.m. to 6 p.m. Some can stay late into the night and close around midnight.

3. Problem statement and research objectives

Studies by several authors (Abrokwah, 2013; Anyidoho, 2013; Beccles, 2014; Boakye, 2011; Broadbent, 2012; Steel, 2012; Luure et al., 2015; Osei-Boateng, 2012; Osei-Boateng & Ampratwum, 2011; Owusu Barimah et al., 2013; Solomon-Ayeh et al., 2011; TUC & WIEGO, 2014a, 2014b, 2013a, 2013b) have generally focused on all vendors in the streets, that is those selling both edibles and non-edible commodities. The majority of these studies employed qualitative and quantitative study design in analysing the data obtained. However, food vendors in the streets have their specificities that are supposed to conform to food safety regulations as compared to the non-food traders. Also, past studies on issues of street food vendors were directed towards Accra, followed by Kumasi and then Tamale. The issues of interest to the majority of those studies were food safety, while others looked at the dynamics of the socioeconomics and all were centred on the solid food not taking into consideration the liquids. This presents a unique challenge and a case on food safety concerns for liquid foods. A recent study by Oduro-Yeboah et al. (2020) focused on examining the challenges related to the distribution and sales practices trading in fresh coconut in the streets of Accra. In this study, potential cross-contamination of packaging materials by fresh coconuts, dipping pared coconut into alum solution to preserve freshness and improper waste handling during and after sales were identified as major challenges to the coconut business.

The role of street vendors in food security cannot be overlooked. Findings from a survey of over 6000 households in 11 cities in Southern Africa by Crush and Frayne (2011) revealed that about 70% of households purchase food daily or weekly from informal outlets. This situation is typical in most African cities. In Sub-Saharan Africa (SSA) urban population is estimated to increase from 376 million in 2015 to over 1.25 billion people by 2050 (UN DESA, 2018). The share of Ghana's urban population was 36% in 1990, increasing to 54% in 2014, and estimated to hit 70% by 2050 (UN DESA, 2018). According to the UN, SSA is only 38.8% urban and Ghana is a special case among countries (UN DESA, 2018). This increasing trend in the urban population in Ghana and some parts of Africa with high dependence on food from the streets, therefore, raises a food safety concern among household consumers who patronize these outlets. Coconut food which is sold on the street is no exception to this.

According to WHO, the outbreak of many diseases especially foodborne illnesses is as a result of poor handling of foods. Also, Ababio and Adi (2012) attributed foodborne illness to the fact that most food handlers or food vendors do not understand the fundamental principles of safe food practices. Regardless of the several health benefits that can be derived from coconut water and other coconut-related products, the management processes may pose some risks to consumers (Oduro-Yeboah et al., 2020). Findings from the aforementioned studies necessitated this study on the liquid aspects of food and its safety concerns for urban consumers.

The handling and processing of coconut by vendors before consumption on the streets of the New Juaben South Municipality is not very hygienic. The growing number of street vendors occupying many streets and public spaces, creating traffic congestion and perceived threat to public order, unsanitary conditions and other unhealthy practices are worrisome. Is it a failure on the part of institutions involved in the food management system or vendor non-compliance to established standards in the municipality? Therefore, the broad objective of this study is to examine the food safety concerns of consumers of fresh coconut in the New Juaben South Municipality of Ghana. Specifically, the study seeks to identify the activities of coconut vendors that pose a threat to food safety and public health, analyse the perception of consumers on the health benefits of fresh street coconut consumption and identify food safety regulatory institutions and their enforcement activities.

4. Methodology

4.1. Study area

The study was conducted in the New Juaben South Municipality in the Eastern Region of Ghana. The municipality shares boundaries with Yilo Krobo Municipal to the north-east, Akuapem North Municipal to the south and Suhum Municipal to the west. It covers a land area of 159 square kilometres representing approximately 0.6% of the total land surface area of the Eastern Region. It has 52 major communities with Koforidua as its capital (Ghana Statistical Service, 2014).

The major economic activities of the Municipality constitute industrial manufacturing and processing representing 39.9% and 26.7%, respectively. Most of the established industries are located in the central business area. Agriculture is carried out in small settlements and also serves as a source of employment to about 26.1% of the total population. They are involved in the production of maize, plantain, cassava, pawpaw, pepper, tomatoes, kola nuts, etc.

The municipality is made up of employed and unemployed people representing about 92.7% and 7.3%, respectively, with ages ranging from 15 years and above, making up about 66.4% of the population being economically active. About 51.2% of the working population are engaged in service and sales, followed by all works related to craft. Women and men representing 35.5% and 20.1%, respectively, are into the service and sales (Ghana Statistical Service, 2014).

4.2. Sampling procedure

The eastern region was selected purposely as the study area because the respondents are relatively more accessible to the researchers. The choice of the region is also as a result of the fact that it is closer and surrounded by three of the most coconut-producing regions in Ghana, namely, Greater Accra, Central and Volta regions. The New Juaben South Municipality was chosen because it is the predominantly urban municipality (93.3%) among the 33 municipalities and districts in the Eastern region (Ghana Statistical Service, 2014), making street food vending a common phenomenon. The level of urbanization in the municipality is explained by the location of the regional capital there.

Both primary and secondary data were used and qualitative research methods from the social sciences were adopted for the analysis of this work. The officials of the municipality's food safety regulatory bodies, coconut vendors and consumers were the major actors of the food system from whom data were collected. Actors were duly informed by the study's objectives and consent was sought for those willing to participate in the study. A well-structured questionnaire and interview guide were used to solicit responses from these actors. Primary data were collected from respondents through the administering of a structured questionnaire. Secondary data were sourced from a desktop search using electronic databases such as Agora, Science Direct, Google Scholar, and Scopus with keywords such as "Street Food Vending"; "Safety of Street Food"; "Activities of Street Food vendors" and "Health benefits of coconut consumption.". About 20 research articles associated with street and food safety relevant for the study were relied upon. These research articles provided enough secondary information needed for study.

Information from the New Juaben South Municipal Assembly indicated that there were 44 coconut vendors in the municipality. Due to their small number, a census of the vendors was proposed to be conducted in the whole month of June 2020 by four enumerators. There were eight concentrated areas of coconut vending in the municipality, i.e., the main lorry station, the Central Post Office, the Koforidua Technical University, the Railway Station, the Passport Office, the Central Police Station, the Government Ministries Offices enclave and the State Insurance Company Offices. Each enumerator was assigned two of these sites and interviewed the vendors as well as consumers who bought the coconut within the period using a purposive sampling technique. After interviewing the stationary vendors and their customers, some vendors who sold their coconut by roaming, i.e., either in head-pans or in wheelbarrows especially on market days of Mondays and Thursdays were also interviewed using an accidental sampling technique. The enumerators did this by moving from the Central Traffic Light along the four diverging streets from the traffic light and their respective adjoining streets as they moved along. In all, 35 coconut vendors and 210 consumers were interviewed using both purposive and accidental sampling, i.e., six consumers were interviewed at each vending point, with an additional 16 interviewees to serve as replacements for possible rejected questionnaires during data analysis. Officials from the environmental health and Food and Drugs Authority of the New Juaben South Municipality were also interviewed to get the institutional regulatory aspects of coconut vending.

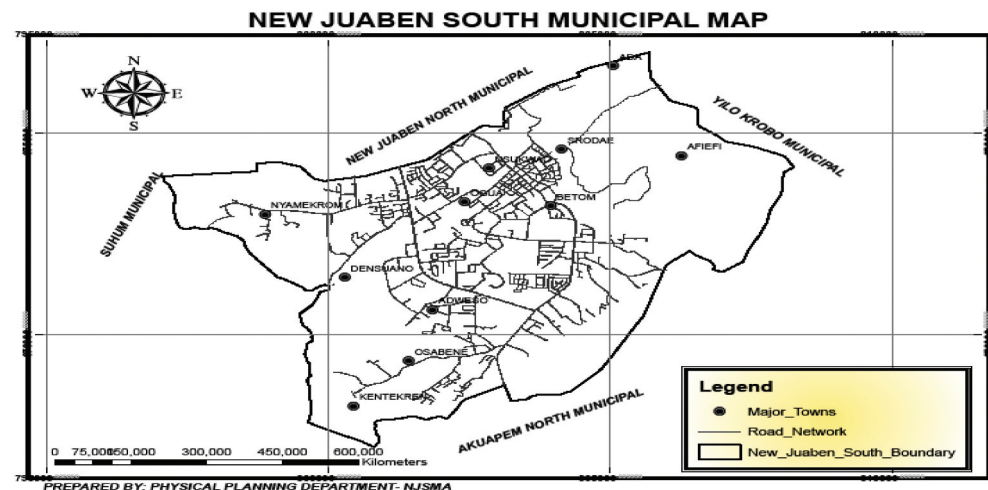
4.3. Data analysis

Descriptive analysis using IBM SPSS statistic 22 was used to analyse the responses of key actors which were tallied and frequencies of the various variables computed in percentage (%) and presented in tables. Frequencies were used as statistical analytical methods because it shows the number of occurrence consumers perceived a variable to be useful or otherwise and this is critical to this study. Chi-square tests were performed to test the significance of various dichotomous responses.

5. Results and discussions

5.1. Characteristics of coconut vendors in the municipality

Coconut vending in the municipality is a male-dominated activity with about 91.4% of the respondents being males and 8.6% females. Table 1 depicts the distribution of the characteristics of the coconut vendors in the Municipality. Unlike other street vending/trade activities, this is contrary to other findings that about two-thirds of the local street vendors in the urban areas of Ghana are women (WIEGO n. d.). According to Mitullah (2004:5), women dominate the street vending business because it requires limited skills, less capital and more pronounced flexibility and



compatibility. In the case of coconut vending, which is an aspect of street trade in Ghana, this may not be applied because it is a laborious trade and requires exertion of physical strength. Special skill is required in harvesting, peeling and splitting fresh coconuts.

A majority (77.1%) of the vendors in the Municipality are adults above 35 years with 22.9% being youth (18–35 years). This suggests no child labour issues concerning this aspect of street trade, although about 12% of child labour is accounted for by the local street trading in the urban centres especially Accra. (Opoku 1998 in Mitullah, 2004:6). About 51.4% of the vendors were introduced into the street coconut vending business by relatives (father, brother, uncle) followed by friends 25.7% and 22.9% by themselves. These were through ways such as apprenticeship and observation from other coconut vendors. Apprenticeship is required in this type of trade since skill is needed to be able to know the type of coconut, how consumers want the coconut (tenderness), the skill in paring and splitting and even in climbing coconut trees and harvesting since in most cases, vendors undertake these activities themselves.

The study revealed that based on the location, the ease of movement with fresh coconut and the number of coconut fruits involved, the type of coconut vending can be classified into stationary and non-stationary. [Figure 1](#) depicts the nature of a non-stationary vendor. This finding supports the earlier studies that classified most Ghanaian street traders as fixed and mobile. They are mostly found on pavements, streets and public gathering (Klun.d:40). About 71.4% are stationary vendors, while 28.6% are non-stationary vendors ([Table 1](#)).

The stationary vendors display their fresh coconut on the bare ground, broken push trucks and tables ([Figure 1](#)), while the non-stationary vendors display theirs in wheelbarrows, functional push trucks, pans and basins ([Figure 2](#)). Stationary vendors have a large number of coconut fruits (more than 100 single fruits), while non-stationary vendors have a small number of coconut fruits (less than 30 single fruits).

While the majority (65.7%) of the choice of location for vending is influenced by the busy nature of a location, 11.4% of the vendors consider places where there are many cars such as lorry parks, roadsides and stations as suitable places to ply their business. More so, 17.1% of the traders choose places where there are government workers with only few 5.8% making a choice based on the availability of space in the municipality since it is not every location or space that such street business could be conducted. Additionally, none of the coconut vendors interviewed either belong to a vendor group/association or has been licensed by the appropriate municipal authorities to operate such a trade ([Table 1](#)).

5.2. Structure used in vending coconut

The use of push truck (broken and functional) remains the most prominent structure in the coconut vending business in the municipality as a majority (48.6%) of the vendors use it. This is followed by wheelbarrows (17.1%) and basin and pans (5.7%). The push-trucks can hold more coconut fruits and are easier to move around compared to other structures, hence the choice of their use by most vendors in the coconut street trade.

5.3. Activities of coconut vendors that threaten food safety and public health

The study identified four major activities, namely, harvesting activities, transportation or conveyance activities to vending centres, handling of coconut during the sale to consumers and the storage activities as a possible source of threat to the safety of food and public health. These sources were further categorized into post-harvesting handling activities and marketing and servicing activities based on the stages in the supply chain.

The activities under post-harvest handling include the harvesting, transportation and conveyance to vending centres and storage activities. The study revealed that during harvesting of coconuts, the fruits are allowed to fall on the bare grounds which in most cases are slightly

muddy, waterlogged areas. Some of the fruits develop slight leakages during this process and become a secondary source of contamination aside from coming into contact with debris and dirt. There are sometimes scars or wounds on the fresh fruits from uncleaned harvesting tools. Fruits are gathered uncovered and sometimes covered with palm fronds and left on the farm for about 2 days in the open at the mercy of rain and sunlight and further contamination with the urine and faecal matter of pests such as squirrels and rodents which negatively affect the quality of coconut water. Thus, the quality of coconut water may be compromised. Also, some toxic chemicals are likely to be absorbed from the soil or water. Results from some studies (Adolf et al., 2012; Walter et al., 2009) indicated that fresh coconut water when contaminated by organisms such as *E. coli*, *K. pneumonia* and *Listeria monocytogens* aids in their development. This becomes a source of health threat to unsuspecting consumers, hence public health concern.

A majority (82.9%) of the vendors have their coconut transported from the source to them in open trucks followed by 17.1% representing other sources of transportation (tricycle “Aboboyaa”, the boot of taxis, etc.). These trucks are not designed to carry coconut alone but other foodstuffs. Fresh coconuts are not put into sacks during the transportation process. They are further contaminated in the process. Most of these open trucks are neither cleaned nor washed. The open nature of these trucks predisposes them to rodents and other pest activities which contaminate the fruit in the conveyance stage. These fresh contaminated coconuts which are mostly not properly cleaned before serving to consumers pose a public health concern.

On storage, the study found out that stationary coconut vendors do not have proper places for the storage of unsold coconut fruits (Figure 3). About 82.9% of the vendors do not have a place to keep their fruits while 17.1% store their unsold coconut in wooden kiosks of other traders. Unsold fruits are left on the bare ground, on tables and trucks uncovered or covered with black polythene sheets. This practice further predisposes the fruits to contamination from dirt and pests. One common practice identified among coconut vendors is the use of alum on pared coconut fruits. Alum is a double sulphate of aluminium, ammonium, potassium or sodium. The alum was manufactured and used for pickling, canning, tanning leather and baking before twentieth century. Due to its side effects, its usage has decreased drastically. Despite these safety concerns, vendors use this substance in the quest of keeping pared coconut fresh. The dosage and frequency of its use pose a challenge to food safety and public health .

The handling of fresh coconuts during the sales (marketing and servicing) process is another aspect of the vending business that poses a threat to safety and public health. The level of cleanliness of the water used by vendors and the type of packaging done for consumers remains a major food safety issue. Vendors operate near open gutters in the municipality, with some close to public toilets. Moreover, unwashed husk are improvised as spoons for scooping the meat of the coconut thereby contaminating the meat during the process. Tender coconut water is packed in small transparent low-density polythene (LDPE) bags for consumers. However, these packaging materials have a high chance of being contaminated since it is kept together with the raw coconuts (Oduro-Yeboah et al., 2020). Such activities predispose the consumer to serious health issues. Additionally, waste from coconut is left in the sales environment for days before being carried away by city waste authorities. The coconut husk and broken shells serve as breeding grounds for mosquitoes and hiding places for reptiles and other pests, posing a public health threat and a safety concern. This supports the findings of Oduro-Yeboah et al. (2020) which state that the way coconut waste is disposed-off may lead to environmental pollution and may serve as breeding grounds for organisms such as insects and rodent pests if not properly managed.

5.4. Consumer level information

A majority (75.7%) of coconut consumers are youth and the consumption of coconut in the municipality is a female-dominated practice (i.e. 57.1%). Table 2 depicts the distribution of the

Table 1. Frequency distribution of characteristics of coconut vendors N = 35

Characteristics	Frequency	Percentage
Age		
18–35	8	77.10
>35	27	22.90
Sex		
Male	32	91.40
Female	3	8.60
Type of coconut vendor		
Stationary	25	71.40
Non-stationary	10	28.60
Ways by which the vendor got into the business		
Relatives	18	51.40
Friends	9	25.70
Self/other	8	22.90
Do you belong to the vendor group?		
Yes	0	0.00
No	35	100.00
Do you have a license to operate as a coconut vendor?		
Yes	0	0.00
No	35	100.00
Educational level		
Nil	13	37.10
Primary	6	17.10
JHS/Middle	7	20.00
Secondary	5	14.30
Post-secondary	1	2.90
Tertiary	3	8.60
Marital status		
Single	16	45.70
Married	15	42.80
Widowed	1	2.90
Divorced	3	8.60
Choice of vending location		
An area with busy commercial activity	23	65.70
Roadside with a lot of cars	4	11.40
Presence of government workers	6	17.10
Availability of space	2	5.80
Experience (Years) in coconut vending		
>5		46.70
5–10 years	50	33.30
>10 years	30	20.00
TOTAL	35	100.00

Source: Field data, 2020.

Figure 1. Stationary vendor displaying his fresh coconut fruit on a table.



Figure 2. Non-stationary vendor displaying fresh coconut on a functional push-truck.



characteristics of consumers in the study area. A majority (90.3%) had one form of education or the other. About 77.2% of them have been consuming fresh coconut from the streets for up to 20 years.

5.5. Health benefits, awareness and consumer perception of safety and hygiene of coconut

Literature was reviewed and questions on the health benefits of consuming tender coconut water (TCW) were posed to consumers (Zulaikhah, 2019). Consumers were asked to indicate their degree of awareness in regard to these health benefits. On the whole, 10 questions were posed to test the consumers' awareness of the health benefits one can derive from consuming TCW. Table 3 illustrates the consumer awareness level on the health benefits of coconut consumption. The results indicate that consumers were aware of seven (7) of the perception questions on health benefits. This suggests a high level of knowledge on the health benefits of what they consume. A majority (87.1%) were aware that consumption of TCW protects one from heart diseases followed by 75.7% on the benefit of improving blood pressure and 72.9% in reducing cholesterol. There is a minimum awareness level of 28.1% antioxidant effect and a maximum awareness of 87.1% of the benefits of protection from heart disease. However, the majority of consumers were not aware of three of the health benefits.

Figure 3. Fresh coconut stored on a table in the sales environment overnight.



Antioxidant effect of 71.9%, anti-inflammatory and analgesic effect of 65.7% and the benefits of preventing oxidative stress (reduces systolic pressure, lowers triglycerides and free fatty acids) of 60.0% were rated low in terms of awareness level. Majority, i.e., 90% of consumers indicated their source of knowledge on the health benefits through various radio and television health programmes. Once a consumer becomes aware of the benefits he/she derives from consuming coconut and its nutritional value therein, it may lead to knowledge accumulation which in turn may challenge already held constructs concerning the product, hence its subsequent patronage and consumption.

A majority (56.6%) of the consumers perceived the sales environment as somewhat clean, followed by 34.7% of not being clean 34.7% and 9.7% not being very clean. [Table 4](#) displays the perception of consumers on the safe and hygienic conditions of fresh coconut. The perception of the sales environment might be due to the reason that some still operate their business near open gutters or drains and pavements and that most of the waste of the coconut is not properly disposed of but left in the sales environment.

Consumers rated the condition of paring and splitting knives and scoops to be somewhat clean (64.3%) followed by very clean (28.6%) and not clean (7.1%). About 66.7% of consumers were not comfortable with the improvised spoon used for scooping the coconut meat ([Table 2](#)). Lack of clean water for washing coconuts before paring and the inability to change the water when it is dirty due to the location of the vendors might account for this. Regarding the appearance of the coconut vendors, the majority of consumers (68.4%) felt that they are somewhat clean. Some of the vendors were seen in aprons and have their fingernails and hair neatly cut, mostly in the case of the stationary vendors. The condition of the unpared coconut was perceived to be somewhat clean (68.4%) followed by not clean (20.4%) and very clean (11.2%). However, the majority of consumers (78.6%) were not comfortable with the use of alum in preserving pared coconut to keep it fresh ([Table 2](#)). In general, consumers rated all the hygienic attributes as somewhat clean, indicating some need for improvement. These attributes contribute one way or the other to the safety conditions and public health concerns of the coconut vending business in the municipality.

Some vendors arrange their wares nicely on tables, push trucks or in wheelbarrows, while others leave theirs in a heap on the ground. A cross-tabulation of consumers' literacy on the effect of their decision of purchase gave the results in [Table 5](#):

Table 2. Distribution of characteristics of consumers in the study area (N = 210)

Characteristics	Frequency	Percentage
Age		
18–35	159	75.70
>35	51	24.30
Sex		
Male	90	42.90
Female	120	57.10
Educational level		
Nil	20	9.50
Primary	10	4.80
JHS/Middle	21	10.0
Secondary	100	47.60
Post-secondary	9	4.30
Tertiary	50	23.80
Marital status		
Single	96	45.70
Married	90	42.80
Widowed	6	8.60
Divorced	18	2.90
Public health threats likely to result from vending operations		
COVID-19 infection	55	26.20
Malaria	76	36.20
Cholera	42	20.00
Dysentery	37	17.60
Are you comfortable with the improvised spoon used by vendors		
Yes	70	33.30
No	140	66.70
Are you comfortable with the use of alum in preserving coconut?		
Yes	45	21.40
No	165	78.60
How long have you been consuming fresh coconut (Years)		
<10	39	18.60
10–20 years	123	58.60
>20 years	48	22.80
TOTAL	210	100.00

Source: Field data, 2020.

A chi-square test performed on the data showed a t-test value of 0.330, which is not statistically significant at even 10% ($P > 0.1$). This means that consumers choice of purchase based on the product arrangement is independent of their level of literacy.

5.6. Public health threats that are likely to result from vending operations

A majority of consumers (36.2%) indicated that the vending operations have the likelihood to result in a malaria outbreak followed by Covid-19 infection (26.2%), cholera (20%) and dysentery

Table 3. A: Consumers level of awareness on the health benefits of consuming tender coconut water (N = 210)

S/No.	Statements	Degree of awareness	
		Aware	Not aware
		Percentage	Percentage
1	Maintaining osmotic pressure inside and outside the cell	52.4	47.6
2	Prevents oxidative stress (reduce systolic pressure, lower triglycerides and free fatty acids)	40.0	60.0
3	Antioxidant activity	28.1	71.9
4	Increases haemoglobin, gene expression and fat and carbohydrate	58.6	41.4
5	Reduces cholesterol	72.9	27.1
6	Improves blood pressure	75.7	24.3
7	Protects the heart from diseases	87.1	12.9
8	Anti-inflammatory and analgesic effect	34.3	65.7
9	Treatment of diarrhoea in children and adults	68.1	31.9
10	Helps to reduce and manage diabetes	61.4	38.6

Source: Field data, 2020.

(17.6%). This is attributed to the poor and improper ways of disposing of coconut waste. Table 2 shows that consumers perceived that the activities of the coconut vendors in one way or the other pose a challenge to food safety and public health. The broken shells are likely to store water and become breeding grounds for mosquitoes resulting in malaria. The no use of sanitizers and lack of running water at the point of sale for vendors to thoroughly wash their hands and sanitize before serving their clients are likely to lead to COVID-19 infections. More so, consumers attributed the somewhat clean sales environment and personal hygiene to be sources of cholera and dysentery.

5.7. Food regulatory institutions and their enforcement activities

Two public institutions, namely, the Food and Drugs Authority (FDA) and the Environmental Health and Sanitation Department of the New Juaben South Municipal Assembly, are statutory bodies that are empowered by the Ghana government to ensure the safety of public foods in the municipality. The legal backing of their operations is the Ghana Public Health Act 2012 (Act 851) which deals with *sale or serving of unwholesome food, sale of food under insanitary conditions and food unfit for consumption*. While the FDA indicates that they are most interested in well packaged “over-the-counter” foods and coconut vending is a grey area for them, the municipal assembly agrees to the responsibility of regulating coconut vending activities. This calls for consultative stakeholder involvement in the formulation of urban food policies, most especially in the area of liquid food (including fresh coconut food vending). Though the assembly has enacted a bye-law to control the disposal of waste, implementing officers do not seem to be strong enough to prosecute people who flout the regulation (Ministry of Local Government and Rural Development, 2020). They also indicated that they are yet to engage coconut vendors in the municipality to undergo medical screening before issuing them with a medical certificate of fitness for them to operate legally. However, these institutions are constrained in terms of logistics and personnel restricting the enforcement of bye-laws and monitoring activities. This affects data and knowledge on the activities and population of coconut vendors in the municipality for effective regulation. Furthermore, officials are particularly worried about communicable diseases (e.g., dysentery, typhoid fever, cholera and fungal hand infections) transmission from vendors to their customers and believe the medical testing will help to forestall this.

Table 4. Perception of consumers on safe and hygienic practices of coconut vendors (N = 210)

S/No.	Item	Categorization	Frequency	Percentage
1	Sales ambience	Not clean	68	34.70
		Somewhat clean	109	55.60
		Very clean	19	9.70
			196	100.00
2	Condition of paring, splitting knives and scoops	Not clean	14	7.10
		Somewhat clean	126	64.30
		Very clean	56	28.60
			196	100.00
3	Condition of water used in washing fresh coconut, knives and scoops	Not clean	14	7.10
		Somewhat clean	96	49.00
		Very clean	86	43.90
			196	100.00
4	The appearance of the coconut vendor (personal hygiene)	Not clean	22	11.20
		Somewhat clean	134	68.40
		Very clean	40	20.40
			196	100.00
5	The appearance of the clothing of coconut vendor (clothing hygiene)	Not clean	40	20.40
		Somewhat clean	140	71.40
		Very clean	16	8.20
			196	100.00
6	Condition of fresh, un-pared coconut	Not clean	40	20.40
		Somewhat clean	134	68.40
		Very clean	22	11.20
			196	100.00

Source: Field data, 2020

6. Conclusion

Coconut vending in the municipality is a male-dominated business. The study revealed that two types of coconut vendors, namely, stationary and non-stationary. This classification of coconut vendors is based on the location, ease of movement with fresh coconut and the number of coconut fruits involved in vending.

The study further showed that there is neglect or little attention on liquid food (i.e. fresh street coconut) by municipal food safety management's agencies and institutions in terms of ensuring compliance by vendors and enforcement of the necessary food safety protocols or standards. This shows a failure on the part of these municipal food-management institutions. There are various activities of street coconut vendors (i.e. post-harvest activities and marketing and servicing activities) that consist of a major threat to the safety of food and public health in the municipality. There is a high knowledge or awareness on the health benefits of consuming tender coconut water TCW among consumers accounting for the continuous consumption of fresh coconut on the streets of the municipality despite challenges with certain practices of vendors that have the likelihood to result in a threat to food safety and public health.

7. Recommendations

It is recommended that activities of coconut vendors should be properly regulated by municipal food safety regulators (Food and Drugs Authority and Municipal Environmental Health and Sanitation Department) because of its cultural significance and health benefits. This could be done through education and awareness creation for coconut vendors on food safety standards;

Table 5. A chi-square analysis of effect of literacy on purchase choice based on product arrangement (N = 210)

Can you read and write (Literate)?		Does the way coconut is assembled affect your choice of purchase?		Total
		Yes	No	
Yes	Count	22.0	163.0	185.0
	Expected Count	21.1	163.9	185.0
No	Count	2.0	23.0	25.0
	Expected Count	2.9	22.1	25.0
Total	Count	2.4	186.0	210.0
	Expected Count	24.0	186.0	210.0

Source: Field data, 2020

Note: N = 210, Pearson's chi square = 0.330, df = 1, Asym. Sig (2-sided) = 0.566

facilitating their formation into a recognized street food vending association; and certification and licensing of individual or group vendors for proper monitoring and regulation.

Additionally, for cleanliness of the municipality, the New Juaben South Municipal Assembly should allocate vantage places in the municipality where vendors can have access to clean water for their activities to promote the sale of wholesome coconut. They should also promote linkages between coconut sellers and waste disposal companies for the effective collection and disposal of coconut waste and create business opportunities by encouraging and supporting smaller craft businesses that use coconut by-products as raw material.

Moreover, the municipal assembly should enforce communicable disease testing protocols on vendors to ensure that all coconut vendors are free from communicable diseases to ensure fresh coconut vending health safety. Finally, policy formulation on urban food safety should be encompassing enough to capture various food vending businesses, especially coconut vending which does not seem to be regulated.

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