***Original Research Article***

SOFT DRINK STORAGE AMONG RETAILERS IN DAR ES SALAAM TANZANIA: EXAMINING PRACTICES, KNOWLEDGE, AND KEY DETERMINANTS

**ABSTRACT**

Soft drink storage practices impact product quality and consumer safety. This study examines storage practices, knowledge, and factors influencing adherence to proper storage guidelines among retailers in Dar es Salaam, Tanzania. A cross-sectional survey of 329 retailers in Kinondoni and Ubungo municipalities was conducted using semi-structured interviews and direct observations. More respondents were male (55.04%), than female (44.96%). The majority of retailers were between 25-40 (53.19%) whereas, secondary and primary education levels dominated among participants (43.77% and 41.95%, respectively). Only 2.74% of retailers were aware of proper storage guidelines provided by a Coca-Cola supplier and none (0%) of the retailers knew of any formal government regulation governing proper storage. Logistic regression analysis assessed the effects of education, business setup, experience, sex, and district on storage practices. Shop-based retailers were significantly more likely to practice proper storage than street vendors (p < 0.001), emphasizing the role of infrastructure. Male retailers were more likely to comply than females (p = 0.020), indicating gender disparities. Education and experience did not significantly impact storage practices (p > 0.05), suggesting economic constraints are stronger determinants. Key challenges for proper storage included financial limitations (64.13%), limited space (21.28%), and unreliable electricity (18.24%). Storage behavior is primarily driven by business structure and financial constraints rather than individual knowledge. Policy interventions should support street vendors with affordable refrigeration, financial assistance, and targeted training to enhance compliance and food safety.

**Keywords**

Soft drink storage, retail practices, logistic regression, food safety, street vendors, Tanzania

**BACKGROUND**

Soft drinks are widely consumed non-alcoholic beverages that typically contain sweeteners, acidulants, carbon dioxide, preservatives, synthetic flavorings, and, in some cases, caffeine (Khadka et al., 2023). These beverages are classified into various categories, including fruit drinks, regular sodas, energy drinks, and artificially sweetened sodas (Chatelan et al., 2022). Recent research indicates that carbonated soft drinks are the second most consumed beverages globally, after water (Evarist et al., 2024). Their popularity is driven by factors such as flavor, refreshment, and their association with increased energy levels, particularly in hot climates (Ali et al., 2023). The global soft drink market was valued at USD 221.55 billion in 2020 and is projected to experience significant growth, with Tanzania's market expected to reach USD 1,252.54 billion by 2024 (Marius et al., 2020).

Adolescents and young adults are the largest global consumers of these soft drinks (Chatelan et al., 2022). However, Children and adults should not consume more than 10% of their daily energy intake from sugar as regular consumption may exacerbates weight gain and non-communicable diseases (Miller et al., 2020).

Despite the growing market demand, improper storage of soft drinks is a critical concern. Wholesalers and retailers often expose soft drinks to direct sunlight and rising temperatures as part of their common storage practices, which can lead to chemical degradation affecting product quality and consumer safety (Omokpariola, 2022). Studies have shown that improper storage may lead to the formation of harmful compounds such as benzene, which has been linked to carcinogenic effects (Azuma et al., 2020). Polyethylene terephthalate (PET) plastic bottles, commonly used in soft drink packaging, can also release phthalates under elevated temperatures, posing additional health risks (Evarist et al., 2024). In Tanzania, recent research suggests that many retailers, especially street vendors, store soft drinks in direct sunlight or under suboptimal conditions due to financial constraints and lack of awareness (Evarist et al., 2024).

**Problem Statement and Justification**

Despite the increasing consumption of soft drinks, there is limited research on how storage practices among retailers impact product integrity and consumer health in Tanzania. Many soft drink retailers operate in informal settings, such as bus terminals and roadside stalls, where refrigeration and proper storage facilities are often unavailable. This raises concerns about how retailers store soft drinks, their level of knowledge on proper storage guidelines, and the potential risks associated with poor practices. Additionally, while regulatory bodies such as the Tanzania Bureau of Standards (TBS) provide general food safety guidelines, it is unclear whether specific regulations on soft drink storage exist or if retailers are aware of them.

Understanding retailers' knowledge and storage practices is essential for developing targeted interventions that ensure consumer safety and maintain product quality in Tanzania's hot and humid climate. This study seeks to answer the question: "What are the storage practices of soft drink retailers in Dar es Salaam, Tanzania, and what factors influence adherence to proper storage guidelines?" To achieve this, the study aims to: Assess the current soft drink storage practices among retailers in Dar es Salaam; Evaluate the level of knowledge retailers have regarding proper soft drink storage and associated health risks; Analyze the relationship between retailers’ demographic factors (e.g., education, experience, and business type) and their storage practices; Identify challenges faced by retailers in implementing proper storage practices; and Explore retailers' awareness of existing guidelines or regulations related to soft drink storage.

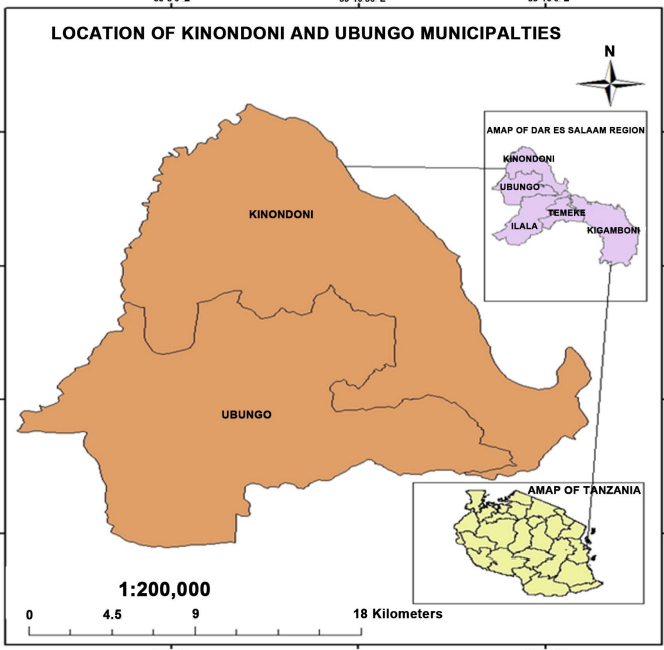
The findings of this study will provide insights into the gaps in knowledge and practices among soft drink retailers in Tanzania. By identifying key barriers to proper storage, the study will inform policymakers, regulatory agencies, and soft drink manufacturers on the need for more comprehensive guidelines, awareness campaigns, and support mechanisms. Furthermore, addressing these storage challenges will help protect consumers from potential health risks associated with improperly stored beverages.

**RESEARCH METHODOLOGY**

**Study Design and Area**

This study employed a cross-sectional survey design whereas, phase 1 of the study was conducted from 9th July, 2024 to 15th July, 2024 and phase 2 was conducted from 23rd September, 2024 to 8th October, 2024. The study was conducted in Kinondoni and Ubungo municipalities, which are among the busiest commercial areas in the city. These municipalities were selected due to their high population density, the significant presence of soft drink retailers, and the diversity of business types, including street vendors, shop-based retailers, and kiosk operators.

Dar es Salaam experiences hot temperatures and humidity, which increases demand for soft drinks and raises concerns about proper storage and potential health risks associated with poor practices. Retailers in open-air markets, bus terminals, and informal vending spaces are particularly vulnerable to improper storage conditions, making these locations ideal for assessing knowledge and compliance with storage guidelines.



**Figure 1: Map of Dar es Salaam Showing the Study Areas**

**Sampling Strategy and Participants**

A multistage sampling technique was employed to ensure a representative sample of soft drink retailers. First, purposive sampling was used to select Kinondoni and Ubungo municipalities due to their high number of informal retailers. Within these municipalities, eight high-traffic areas were identified based on retail density and customer flow, including Kawe Bus Terminal, Makumbusho Bus Terminal, Magufuli Bus Terminal, Mbezi Luis Bus Terminal, Simu 2000 Bus Terminal, Mbezi Chini (Segerea Stand), Tegeta kwa Ndevu Bus Terminal, and Masaki Coco Beach Recreation Center.

To ensure a broader representation, five additional study areas were randomly selected from a list of ten major transport hubs, including Kimara Korogwe Bus Terminal, Manzese Tiptop Bus Terminal, Mwananyamala Hospital Bus Terminal, Msasani Macho Bus Terminal, and Morocco Bus Terminal. Within these locations, convenience sampling was used to recruit retailers, ensuring inclusion of both formal (shop-based) and informal (street vendors and kiosk operators) retailers.

A total of 329 soft drink retailers were recruited for the study using convenience sampling, which was practical given the dynamic and mobile nature of street vending. Initially, 339 retailers were approached, but 10 declined participations, leaving a final sample size of 329 respondents. The sample included street vendors (53.59%), shop-based retailers (26.74%), and kiosk operators (19.76%), reflecting the diversity of the soft drink retail market in Dar es Salaam.

**Data Collection Methods**

Primary data were collected through face-to-face interviews using a semi-structured questionnaire. The questionnaire consisted of both closed-ended and open-ended questions covering key aspects such as storage practices, retail purchasing and selling practices, knowledge of soft drink ingredients and health risks, awareness of storage regulations, and challenges in implementing proper storage. Field observations were conducted to supplement questionnaire responses by assessing the physical storage conditions, exposure to sunlight, refrigeration availability, and handling practices at the retail locations.

A pilot study was conducted with 20 respondents to pre-test the questionnaire, ensuring clarity and relevance of questions. Minor modifications were made to improve accuracy and respondent comprehension. The questionnaire was designed in English but administered in Swahili, ensuring ease of understanding among participants. Interviews lasted approximately 30 minutes to balance comprehensive data collection with minimal business disruption.

Additional secondary data were obtained from published studies, regulatory documents, and reports from food safety authorities to provide contextual background and support data interpretation.

**Data Processing and Analysis**

Data were entered into Microsoft Excel and cleaned to ensure completeness and accuracy. Missing values and inconsistent responses were identified and addressed. Descriptive statistics, including frequencies and percentages, were used to summarize the demographic characteristics of respondents and their storage practices.

Categorical variables, including education level, business setup, experience, gender, and district, were coded into numerical values for regression analysis. The dependent variable, storage practice, was derived from the "grade" column, where "good" storage practices were coded as 1, and "moderate" and "poor" were coded as 0 to create a binary outcome suitable for logistic regression. To determine the factors influencing soft drink storage practices among retailers in Dar es Salaam, the study employed a binary logistic regression model. Logistic regression is appropriate for modeling relationships where the dependent variable is dichotomous (binary). The probability of a retailer adopting good storage practices was modeled as follows:

Where:

* ​ = Probability of retailer i following good storage practices
* = Log-odds of adopting good storage practices
* = Intercept
* ​ = Educational background of retailer i
* ​ = Business setup (Shop, Kiosk, or Street Vendor) of retailer i
* ​ = Experience (years selling soft drinks) of retailer i
* = Gender of retailer i (1 = Male, 0 = Female)
* = Location of retailer i (1 = Kinondoni, 0 = Ubungo)
* = Error term

The model was estimated using the maximum likelihood estimation (MLE) method. The logistic regression results included: Coefficient estimates (β) – Indicating the direction and strength of the relationship between predictor variables and the likelihood of adopting good storage practices. Odds ratios (exp(β)) – Representing the change in odds of proper storage for each unit change in an independent variable. p-values – Assessing statistical significance, with values below 0.05 indicating a significant influence on storage practices. The model was evaluated for goodness-of-fit using the log-likelihood ratio test and pseudo R-squared value. Data analysis and regression estimation were conducted using Stata 17 and Python (Stats Models library).

Data were presented in tables to enhance clarity and interpretation.

**Ethical Considerations**

Ethical approval for the study was obtained from Sokoine University of Agriculture. Permission to conduct research was also granted by the Tanzania President's Office - Regional Administration and Local Government and the respective Municipal Councils of Kinondoni and Ubungo. Participants provided informed consent before participating, ensuring that they understood the purpose of the study, their rights, and the confidentiality of their responses. All data were anonymized to protect participant identities.

**RESULTS**

**Socio-Demographic Characteristics of Respondents**

A total of 329 soft drink retailers from Kinondoni and Ubungo municipalities participated in the study. The majority of respondents (55.04%) were male, while 44.96% were female. Age distribution showed that 53.19% of respondents were between 25 and 40 years, while 34.95% were between 18 and 24 years. Educational attainment varied, with 43.77% having completed secondary education, 41.95% completing primary education, and 6.68% attaining a college degree. Notably, no respondent reported having university-level education.

Regarding business ownership, 64.44% of respondents owned their businesses, while 35.56% were employees. The most common business setup was street vending (53.59%), followed by shop-based retailers (26.74%) and kiosk operators (19.76%). The majority of retailers (63.83%) had 1–5 years of experience, while 18.56% had more than five years of experience, and 17.63% had been in the business for less than a year. Table 1 presents the socio-demographic characteristics of the respondents.

**Table 1: Socio-Demographic Characteristics of Respondents**

| **Variable** | **Frequency (n=329)** | **Percentage (%)** |
| --- | --- | --- |
| **Gender** |  |  |
| Male | 171 | 55.04 |
| Female | 158 | 44.96 |
| **Age (years)** |  |  |
| 18-24 | 111 | 34.95 |
| 25-40 | 179 | 53.19 |
| 41-55 | 36 | 10.94 |
| 55-64 | 3 | 0.92 |
| **Education Level** |  |  |
| No formal education | 24 | 7.60 |
| Completed primary education | 138 | 41.95 |
| Completed secondary education | 145 | 43.77 |
| College | 22 | 6.68 |
| University | 0 | 0 |
| **Business Ownership** |  |  |
| Yes | 212 | 64.44 |
| No | 117 | 35.56 |
| **Selling Setup** |  |  |
| Street Vendor | 175 | 53.59 |
| Shop | 88 | 26.74 |
| Kiosk | 65 | 19.76 |
| **Years in Business** |  |  |
| Less than a year | 57 | 17.63 |
| 1-5 years | 211 | 63.83 |
| More than 5 years | 61 | 18.56 |

**Soft Drink Storage Practices Among Retailers**

Findings revealed that the most common storage method was using coolers with ice (65.35%), followed by refrigeration (22.8%). However, 11.85% of retailers exposed soft drinks directly to sunlight, particularly hawkers. Among those using coolers, only 34.89% regularly refilled ice, with 93.33% of them doing it once per day, primarily due to cost constraints (65.71%). For hawkers, drinks were left out in the sun for ninetyminutes by the majority (56.41%) before being refrigerated.

About 84.80% of respondents protected soft drinks from extreme temperatures and sunlight, and the most common methods mentioned were staying under tree canopy/ umbrella shade (51.97%).

Transportation of soft drinks from wholesalers to retail locations was conducted via motorcycles (39.51%), three-wheeled vehicles (25.84%), and auto rickshaw (15.2%), all of which provided minimal protection against heat exposure. Only 4.56% used public minibuses, which offered more shade.

**Table 2: Storage Practices Among Retailers**

|  |  |  |
| --- | --- | --- |
| **Storage Method** | **Frequency (n=329)** | **Percentage (%)** |
| **Storage Type** |  |  |
| Cooler with ice (stall/kiosk) | 215 | 65.35 |
| Refrigerator (kiosk/shop) | 75 | 22.8 |
| Exposed to sunlight (hawker) | 39 | 11.85 |
| **Ice Refilling Practices** |  |  |
| Yes, refilling ice | 75 | 34.89 |
| No, not refilling ice | 140 | 65.11 |
| **Frequency of Ice Filling** |  |  |
| Once | 70 | 93.33 |
| Twice | 5 | 6.67 |
| **Reasons for Not Refilling Ice** |  |  |
| Cost | 92 | 65.71 |
| Drinks remain cold enough | 48 | 34.29 |
| **Time for Direct Exposure to Sunlight** |  |  |
| 30 minutes | 8 | 20.51 |
| 60 minutes | 9 | 23.08 |
| 90 minutes | 22 | 56.41 |
| **Protection from Extreme Temperatures** |  |  |
| Yes, doing protection | 279 | 84.8 |
| No, not doing protection | 50 | 15.12 |
| **Protection Method** |  |  |
| Sell under shade | 145 | 51.97 |
| Keep in coolers | 112 | 40.14 |
| Refrigerate | 65 | 23.30 |
| Cover with nylon | 20 | 7.17 |
| Cool indoor heat with a fan | 8 | 2.87 |
| **Transportation Method** |  |  |
| Motorcycle | 130 | 39.51 |
| Three-wheeled vehicle (toyo) | 85 | 25.84 |
| Auto rickshaw (bajaji) | 50 | 15.2 |
| Public minibus | 15 | 4.56 |

**Retail Purchasing and Selling Practices**

Most retailers (73.56%) bought soft drinks from wholesalers and over half (61.09%) of them restocked on a daily basis. Majority of the retailers (91.49%) started selling soft drinks in the morning, with the sales peaked in the afternoon at 58.97% followed by 31.91% in the afternoon, 7.60% and 1.52% in the morning and evening respectively.

**Knowledge of Soft Drink Storage Guidelines and Health Risks**

Majority (80.55%) of the retailers opted refrigeration as the best way for storing soft drinks, with customers’ preference for cold drinks reported as the primary reason in this decision (93.80%). Only 2.74% of respondents were aware of any storage guidelines provided by Coca-Cola supplier for keeping drinks away from direct sunlight, and none of the retailers (0%) knew of any formal government regulations on soft drink storage. The majority (73.25%) were unaware of the ingredients in soft drinks, and almost all respondents (99.7%) had never heard of benzene or any chemical contamination risks in carbonated beverages caused by poor storage.

When asked about the potential health risks of frequent soft drink consumption, 56.53% of respondents acknowledged health concerns, with heart disease (34%) being the most commonly cited issue. However, knowledge of storage related health risks was very low (6.08%), with only (2/20, 7.69%) of them associating improper storage with cancer risks. Word of mouth was the major source of the health risks information by the majority (56%).

**Factors Influencing Soft Drink Storage Practices**

A logistic regression analysis was conducted to examine the influence of education level, business setup, experience, gender, and district on soft drink storage practices among retailers in Dar es Salaam. The dependent variable was storage practice, categorized as good (1) or poor (0) based on retailers' adherence to proper storage guidelines. The model demonstrated a pseudo R-squared value of 0.1397, indicating moderate explanatory power. The log-likelihood ratio test (p = 9.349e-05) confirmed that the model was statistically significant. The regression results are presented in Table 3, showing the estimated coefficients, standard errors, z-values, and p-values.

**Table 3: Logistic Regression Results for Factors Influencing Soft Drink Storage Practices**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Predictor** | **Coefficient (β)** | **Standard Error** | **z-value** | **p-value** | **Interpretation** |
| Constant (Intercept) | -1.8410 | 0.982 | -1.875 | 0.061 | Baseline log-odds of poor storage. |
| Educational Background | -0.0486 | 0.205 | -0.237 | 0.812 | Not significant – Education level does not strongly influence storage practices. |
| Business Setup (Selling Setup) | -1.1952 | 0.320 | -3.739 | 0.000 | Highly significant – Shop-based retailers are significantly more likely to follow proper storage practices than street vendors. |
| Experience (Years Selling Soft Drinks) | -0.1807 | 0.276 | -0.655 | 0.513 | Not significant – Experience does not significantly impact adherence to proper storage. |
| Gender | 1.0686 | 0.460 | 2.325 | 0.020 | Significant – Male retailers are more likely to follow proper storage practices than female retailers. |
| District | 0.3350 | 0.274 | 1.224 | 0.221 | Not significant – District location does not have a strong impact on storage practices. |

**Challenges in Proper Soft Drink Storage**

Financial constraints emerged as the most significant barrier to proper storage, with 64.13% of retailers citing a lack of capital for purchasing refrigeration equipment. Limited space was also a major issue, as 21.28% of retailers kept soft drinks outside in direct sunlight due to shop size limitations. Other challenges included unreliable electricity supply (18.24%), excessive heat buildup in kiosks and shops (12.16%), and faulty refrigeration equipment (7.60%).

**DISCUSSION**

The study examined soft drink storage practices among retailers in Dar es Salaam, highlighting key factors influencing adherence to proper storage guidelines. This study found that 55.04% of men dominated the soft drink vending business. This study aligns with findings from Mwanza, Tanzania where 93.3% street food vending business was dominated by men (Magambo *et al*. 2023). According to Mwove (2025), this might be because of gender roles and cultural norms, which frequently assign males to more entrepreneurial activities while putting women in more interruption-prone roles because of family responsibilities.

This study found that, 53.19% of the respondents were between the ages of 25 and 40, whilst 34.95% was between the ages of 18 and 24, which represents this type of business is associated with active age individuals. These results are consistent with those of Magambo *et al*. (2023),who found that street food vendors were more between the ages of 18 and 45.

Findings from this study show that majority (64.44%) of respondents owned the soft drink business. This aligns with Karondo *et al*. (2021) who reported 61% of the street food vendors started up their business through their own savings and required little initial cost to run since it operates in open, free spaces without any payments.

However, Secondary and primary education levels dominated among participants (43.77% and 41.95%, respectively). This study is similar to the findings of Magambo *et al*., (2023) and Ann & Kaunye (2023), who reported 53.3% and 55% of the street vendors in Tanzania and Kenya had completed secondary school, respectively. The large proportion of participants with primary and secondary education may be due to Tanzania's government's efforts to guarantee that all children attend school and offer free education in public schools from primary to secondary level (Magambo *et* *al*.,2023).

The study found that soft drink vending, including stalls and hawkers who worked in open areas, accounted for 53.59 % of business selling setups. While shops constructed from iron sheets and kiosks using strong nylons and tarpaulin accounted for 26.74% and 19.76% respectively. The study aligns with Karondo *et al*. (2021), findings who revealed that, majority of the street food vendors (76.8%) operated in open free spaces, with 23.2% operating in rental spaces. Operating in open environments exposes soft drinks to heat, light, and direct sunlight, which can degrade preservatives and other sensitive compounds, potentially compromising product safety and posing health risks (Omokpariola, 2022).

The study found that, 63.83% of the retailers had been selling soft drinks for 1–5 years. The results are in line with those of Tumaini (2023); and Karondo *et al*. (2021), who reported that, most street food vending operations in Dar es Salaam's Ubungo and Ilala Municipalities, Tanzania had been in operation for three to four years respectively.

The study found that 65.35% of the respondents used domestic cool boxes for selling or non-functional refrigerators where they placed ice, with the majority selling in open areas within bus stands. Similar results were found among street vendors on Brazilian beaches, where cool boxes were used to cool 82.4% of industrial beverages, according to Alves da Silva *et al*. (2014). This indicates that the infrastructure of a business setting determines the storage method.

According to Khan & Hafiz (2024), domestic ice boxes frequently have difficulty in keeping ice solids for extended periods, necessitating frequent ice replacement while refrigerators continuously control food temperature. This study found that only 34.89% of respondents who used coolers or non-functional refrigerators routinely filled them with ice, whereas 93.33% of them did it at least once, and just 6.67% filled them with ice at least twice. Cost (65.71%) was mentioned by the majority (65.01%) for not filling coolers with ice. These results are in contrast with Dal *et al*. (2016), who found that among street vendors storing food on ice, none had the resources to change the ice during their operation and this difference might have been brought about by the type of food product. Furthermore, the frequent opening and closing of the coolers were observed to cause the drinks to warm up as could be seen, the extreme heat of Dar es Salaam had caused a large amount of ice to melt. In this study, areas reported to do ice filling include: Mbezi Luis Terminal bus stand, where they ran overnight; Kawe Terminal bus stand during religious gatherings; and Coco Beach recreation center on Fridays, Saturdays, and Sundays, when customer traffic was very high.

Among hawkers (39/329, 11.85%), the majority (56.41%) of them exposed the soft drinks to direct sunlight for 90 minutes, although half (20/39, 51.28%) of them covered the containers they carried with clear plastic to keep the drinks cold by reducing direct exposure to sunlight before bringing them back to the shops where they were bought to be refrigerated. Exposure of soft drinks by sellers to direct sunlight is very common as cited my number of researches which may compromise the product integrity as well as consumer safety (Akolawole et al,.2022; Evarist et al,. 2024; Omokpariola, 2022).

According to Akolawole *et al*. (2022), distribution of soft drinks under direct sunlight, high temperatures, and exposure to light is common among retailers. This study found that, due to cost and availability, 39.51% of the retailers transported soft drinks using motorcycles, 7.29% walked, 25.84% used three-wheeler cargo vehicles (*toyo*), and 7.60% used carts; all of these transports s were open, exposing the drinks to direct sunlight. On the other hand, just 15.20% of retailers used auto rickshaws (*bajaji*) and 4.56% used public minibuses, which offered shade from direct sunlight. These findings are in line with those of Dal *et al*. (2016), who found that Brazilian street food sellers use various transportation methods similar to this study. However, the percentage distributions differed, with 44% using vehicles, while 5% rely on buses, 21% walk, 28% carts, and 5% using motorcycles. These unfavorable conditions could lead to chemical changes that might compromise the safety of the soft drinks. Therefore, even though open vehicles are an economical means of transportation, if suitable insulation or shade is not used, they may affect the integrity of the soft drinks.

The results further revealed that 73.56% of the respondents purchased soft drinks from wholesalers, while 26.44% sourced them from retailers. Notably, hawkers predominantly relied on retailers due to limited access to cooling facilities. The study’s findings are consistent with Dal *et al*. (2016), who reported 80% of

the Brazilian street food vendors purchased soft drinks from wholesalers and 20% from retailers. Therefore, because the majority of retailers bought soft drinks from wholesalers who were also reported by Omokpariola (2022), to expose soft drinks to direct sunlight or high temperatures, they should also be offered with the storage training. Furthermore, the study observed that, 61.09% of the retailers restocked on a daily basis. The fact that most bus stations observed to face logistical constraints, such as limited space for large coolers, often results in smaller and more frequent restocking cycles

This study found that, 91.49% of the retailers started selling soft drinks in the morning and sales peaked in the afternoon at 58.97%. Retailers probably opened early to accommodate morning passengers and maximize operating hours, guaranteed stock availability and cold beverages during busy times, such as the hottest afternoons, when demand is high. These results align with Saku et al, ( 2020); and Oscar (2022) who reported higher consumption (42.4% and 55.3%) of energy drinks in the afternoon respectively. As the study indicates, this implies that beverages are subjected to unfavorable conditions for an extended period of time, underscoring the significance of appropriate storage awareness.

Notably, refrigeration was opted as the best way for storing soft drinks by the majority (80.55%), with customers’ preference for cold drinks reported as the primary reason in this decision (93.80%). These results align Adegun *et al*. (2022), who reported Dar es Salaam has a tropical climate making it hotter than average, influencing demand for cold drinks, especially when tired from hot surroundings, as they enhance mood, according to Projeck (2020). This indicates that more training is required because individuals still do not see the significance of storage.

Alarmingly, nearly all of the respondents (97.26%) did not know of any soft drink storage guidelines; only 2.74% mentioned Coca-Cola-trained practices like keeping drinks upright and storing them in a cool place. Moreover, all of the respondents (100%) were unaware of formal regulations governing proper storage of soft drinks. The results of the study are consistent with those of Juma *et al*.(2018); Magambo *et al*. (2023), who found that 81% of food vendors lacked understanding of regulations governing food vending and 86.7% of the street food vendors did not follow the recommended food safety standards respectively.

Alarmingly, only 6.08% of the retailers admitted to knowing the negative health impacts of improper storage of soft drinks. However, at least 56.53% knew of the dangers associated with frequent consumption of soft drinks and especially energy drinks. Heart problem was the most commonly mentioned health problem (38%). These results align with Oscar (2022), who found that 79.5% of non-energy drink consumers were aware of the health effect of consuming them and among the health problems raised are consistent with Rashid (2020). The most commonly raised issue (12/329, 92.31%) was stomach problems which were connected to contamination. While only one respondent (7.69%) said that cancer could be a concern, citing the chemical breakdown of plastic bottles due to poor storage of plastic bottles at high temperatures.

In this study, the major source of information about the health effects was the word of mouth (56%).This contradicts those of Offiong Etim *et al*. (2022),who found that word of mouth, which accounted for 26.8% of the five sources, ranked third, while the majority (59.8%) of local drink producers accessed health risks information associated with using previously disposed-of bottles for local drinks through media (radio/TV).

The logistic regression analysis identified business setup and sex as significant predictors of soft drink storage practices. Business setup emerged as the strongest determinant, with shop-based retailers significantly more likely to adhere to proper storage practices than street vendors (p < 0.001). This finding suggests that structural factors, including access to refrigeration and secure storage spaces, play a more crucial role in influencing storage practices than individual knowledge levels. These results are consistent with prior research indicating that formal retail environments provide better compliance with storage regulations due to increased access to storage facilities and greater regulatory oversight (Evarist et al., 2024).

Gender differences in storage practices were also observed, with male retailers significantly more likely to follow proper storage guidelines than female retailers (p = 0.020). This contradicts with the findings of Kelvin *et a*l (2024).This disparity may be attributed to sample size, differences in access to business resources, financial capital, and decision-making autonomy. Studies have suggested that female retailers in the informal sector often face economic constraints that limit their ability to invest in storage infrastructure due to a shortage of credit, collateral, and cultural perceptions that favor men with regard to asset ownership (Wilbard & Mbura, 2017).Addressing this issue requires gender-inclusive business support programs, including financial incentives for women entrepreneurs, business management training, and targeted awareness campaigns.

Contrary to expectations, education level and years of experience did not significantly influence storage practices (p = 0.812 and p = 0.513, respectively). These findings challenge the assumption that higher education levels lead to better compliance with food safety regulations. Instead, they reinforce the argument that economic and structural constraints have a greater influence on business practices than individual knowledge. This is in contrast with research suggesting vendors with higher levels of education have a greater awareness of food safety, which enhances their understanding of existing food safety information (Ann & Kaunye 2023). Moreover, this study contradicts with a research conducted by Magambo, *et al*.,(2023) which reported workers with greater experience tend to display higher knowledge scores and better adherence to food safety protocols.

The study found no significant difference in storage practices between Kinondoni and Ubungo districts (p = 0.221), suggesting that geographic location does not strongly influence adherence to proper storage guidelines. This finding implies that urban retail environments in Dar es Salaam face similar constraints regardless of district, reinforcing the need for city-wide intervention rather than location-specific policies. While district-level enforcement mechanisms may vary, storage behavior is primarily driven by factors such as business setup, infrastructure availability, and financial capacity.

Retailers identified several challenges in implementing proper soft drink storage practices, including financial limitations, space constraints, unreliable electricity, and faulty refrigeration equipment. The most frequently cited challenge was lack of capital to invest in refrigeration equipment (64.13%), a common issue in informal retail markets where profit margins are often too low to support significant infrastructure investment. This result is consistent with a study undertaken in Dodoma, Tanzania by Juma *et al*. (2018), which found that 76% of street food vendors identified a lack of funding for storage facility purchases as a major obstacle to the efficient implementation of food vending regulations. Additionally, 21.28% of retailers reported space limitations, particularly kiosk operators who often store soft drinks outdoors due to restricted shop space. Another notable challenge was unreliable electricity supply (18.24%), which affects the ability to maintain consistent cooling. Furthermore, 7.60% of retailers reported refrigeration breakdowns, exacerbating storage difficulties. These findings highlight the structural and economic barriers preventing retailers from adopting optimal storage practices.

Moreover, it was noted that all of the drinks on display at the stalls were found to be in direct sunlight. This is consistent with the findings of Uchendu & Abuja (2022),who found that half (33% ) of market soft drinks petty traders kept their drinks out in the open. For this case, frequent soft drinks consumers may be at health risk since soft drinks often contain preservatives, exposing them to undesirable conditions may combine to form benzene, a Group 1 carcinogen as categorized by the International Agency for Research on Cancer (IARC) as reported by Azuma *et al*., (2020).

**Conclusion and recommendations**

The study highlights business setup and gender as key determinants of soft drink storage practices among retailers in Dar es Salaam. Street vendors face significant storage challenges due to financial constraints and lack of infrastructure, while male retailers are more likely to follow proper storage guidelines than female retailers. Education and experience, while traditionally considered important, do not significantly influence storage behavior, emphasizing that economic and structural factors are the primary drivers of compliance.

To address these challenges, a multi-faceted approach is required, several policies and practical interventions can be implemented to improve soft drink storage practices among retailers.

First, there is a need for infrastructure investment, particularly in providing affordable refrigeration solutions for street vendors and kiosk operators. One potential approach is the introduction of microfinance programs that enable small retailers to acquire cooling equipment through flexible repayment schemes. Additionally, partnerships between beverage manufacturers and retailers could facilitate the provision of rental based refrigeration units or discounted storage equipment for vendors with consistent sales volumes.

Second, targeted training and awareness campaigns should focus on practical, business-friendly storage solutions. The findings suggest that knowledge alone does not drive better storage practices; thus, interventions should emphasize low-cost, energy-efficient storage methods that are feasible for small-scale retailers. Moreover, given the gender disparities observed in the study, gender-sensitive business support programs should be introduced to empower female retailers with access to financial resources and technical training.

Finally, regulatory enforcement and incentives should be considered to promote compliance with proper storage guidelines. Government agencies could introduce tax benefits or subsidies for retailers investing in proper storage equipment. Additionally, local authorities could develop incentive programs for retailers who consistently adhere to proper storage practices, such as preferential access to business development programs or supplier discounts.

**Disclaimer (Artificial intelligence)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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