

# Safety Assessment of Street Hot Beverages Made of Coffee, Tea, Milk or Cocoa Consumed in Abidjan City

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**Abstract** In recent years, sale and consumption of hot beverages made of coffee, tea, milk or cocoa powder in street have grown, especially in Abidjan city. Despite the potential of hot beverages to contribute to Ivorian food security, no detailed information on the consumption of hot beverages is available. The aim of this study was to assess the knowledge, attitudes and practices of hot beverage consumers in Abidjan. A questionnaire and direct observation were used to evaluate the effects of these beverages on consumer health. The survey was conducted in the street of five communes of Abidjan where we found consumers of street vendors with coffee carts. The study revealed that tea (38.4%) was the most consumed, followed by coffee drinkers (31%), coffee with milk (16.6%), milk (10.8%) and cocoa powder beverage (3.2%). Consumers that aged ranged from 20 to 34 years consumed more tea (20.2%) and coffee (19.4%). More than half of consumers (50.4%) consumed only one cup per day. The survey revealed that most of consumers (42%) consumed hot beverages in the morning and 24.2% of consumers drank it at any time. Most of tea consumers (24.4%) preferred it with sugar and lemon, according to 7.6% of consumers, it was against tiredness. Coffee was consumed mainly with sugar by 25% of consumers as exciting (16.2%). This study also revealed that coffee consumption was dominated by males (36.2%) and tea was more popular among females (42.3%) than males (37.5%). Unfortunately, hot beverage consumers (5.6%) surveyed reported negative effects such as diarrhea (1.2%), nausea (0.6%), vertigo (0.6%) and hand tremors (0.6%) after drinking hot beverage from street beverage vendors. This study is the first that evaluated five hot beverages made of tea, coffee, milk, coffee with milk or cocoa powder consumption from street vendors with coffee carts in Côte d'Ivoire.

**Keywords:** street beverage consumption, food safety, coffee, tea, milk, cocoa

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## 1. Introduction

A beverage is a drink specially prepared for human consumption either at meal or leisure times. Hot beverages often contain caffeine and are termed 'hot' because they are usually served hot by addition of hot water and other ingredients [1]. Non-alcoholic beverages are important sources of nutrients and bioactive compounds that may influence human health and increase or decrease the risk of chronic diseases [2]. Hot beverages sold by street vendors with coffee carts are street foods. In today's world, people prefer to buy food sold on streets to meet their nutrition needs outside home. Street foods are being prepared and sold at places like streets, schools, train stations, bus terminals, entertainment and festival areas where people are crowded [3].

Tea is one of the most consuming beverages in the world after water [4] and the most devoured non-alcoholic

refreshment on the planet [5] with an estimated daily consumption of 15-20 billions cups. This is due to its refreshing, mild stimulant properties, and also to its medicinal and general health-promoting purposes [6]. Coffee is one of the most popular beverages consumed worldwide, with a global production output of *ca.* 7 million tons in 2010, compared to 6.7 million tons in 1998-2000 [6]. Coffee typically contains more caffeine than most other beverages, and is widely and frequently consumed [7,8]. People drink coffee to relax and enjoy its diverse favours and aromas. It has physiological and psychological effects beyond its nutritional benefits [9]. Many people can choose between coffee and tea, and drink these in varying ratios depending on taste preference, lifestyle, socio-economic factors, genetics and health [10]. Milk may play an important role in supporting competitive and amateur sports activities as a source of protein and minerals during recovery after exercise [11]. Bovine milk and dairy products have been part of the human diet, from birth to old age [12]. Coffee, tea, cocoa

are familiar beverages for people in Arabic and North African countries [13]. Some studies showed that such drinks may be consumed by young adults, teenagers, college students, athletes, and military personnel [14].

Few studies were available on hot beverages in Africa particularly in Côte d'Ivoire. According to our knowledge, there is no data on hot beverage sold and consumed from street vendors with coffee carts. Therefore, there is an urgent need for research on street beverage and particularly in Côte d'Ivoire, which appears to have rarely been the focus of previous research in this field [15]. Despite the potential of hot beverage to contribute to Ivorian food security and reducing poverty levels through income generation, no detailed information on the consumption of this hot beverage is available. So, the objective of this study was to evaluate the knowledge, attitudes and practices of hot beverage consumers in Abidjan city.

## 2. Materials and Methods

### 2.1. Study Area and Sampling

The study was carried out in Abidjan, the economic capital of Côte d'Ivoire, in West Africa. This study was conducted from July 8 to 13 December, 2019 in five communes of Abidjan city: Abobo, Adjamé, Yopougon, Cocody and Port-Bouet (Figure 1). Consumers of street beverage products were selected based on their willingness to participate to this study. A survey was carried out to describe the attitudes, practices of consumption, the preferences and reason for hot beverage consumption. A total of 500 consumers (100 respondents per commune) were selected for the interview.

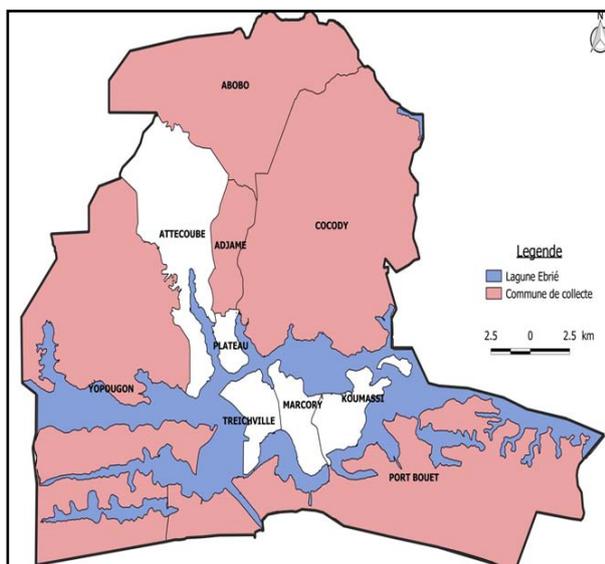


Figure 1. Map of Abidjan city showing study locations

### 2.2. Survey Conducting

The survey was conducted according to the method of [16]. Methods of collecting data were face-to-face interviews using standardized questionnaires (written surveys) for consumers. Written surveys allowed asking

questions to consumers of hot beverages. The questionnaire was used for consumers of hot beverages of tea, coffee, milk, coffee with milk or cocoa powder sold in street by vendors with hand mobile carts. The survey was conducted in the street (in streets, transport station and market), areas where we found consumers in Abidjan city. In the selected commune, consumers predisposed who were drinking, were randomly questioned. The questionnaire focused on themes, namely the preferred hot beverages, beverage consumption, frequency of consumption, and disease related to beverage consumption. Socio-demographic information such as age, gender and education level were also collected. The questionnaire was coupled with direct observation on the selected consumers.

### 2.3. Survey Description

This survey has been conducted for consumers of all ages who sold and consumed hot beverages. The respondents for these analyses were about 500 consumers and volunteer to respond to the questions. This survey has been conducted for consumers of all ages who consumed hot beverages sold in street with coffee carts.

In Côte d'Ivoire, it is unnecessary to receive written consent of participants for structured written questionnaires. The Ethics Statement included in the questionnaire instructions clearly stated that only respondents who agreed to the instructions participated in the survey. All of the participants read (for consumers unable to read, we explained) and approved the statement before participating to the survey.

### 2.4. Inclusion Criteria

The questions were only asked of those who reported buying and consuming hot beverages from street vendors with push hand mobile coffee carts.

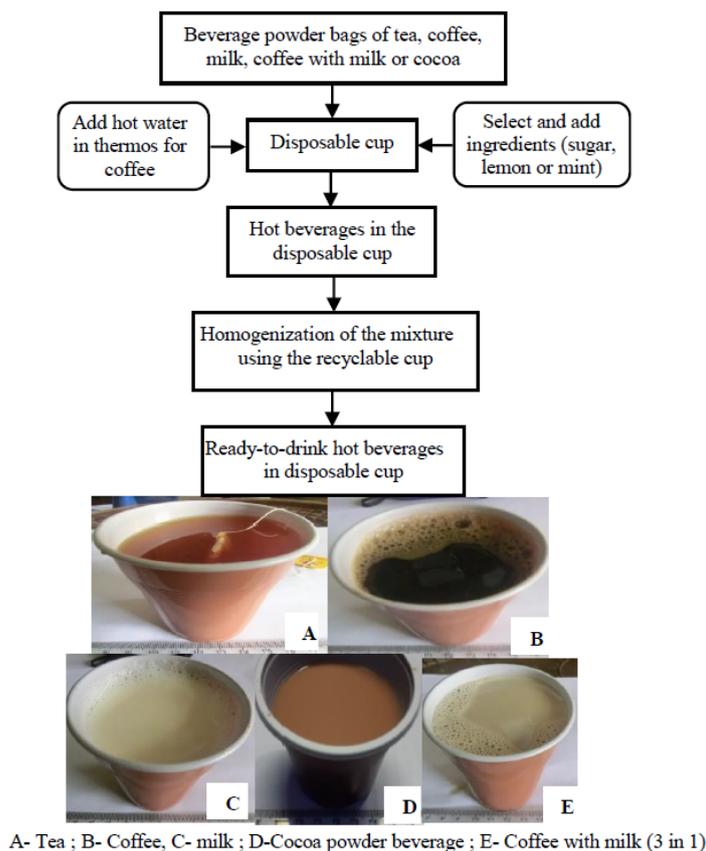
### 2.5. Data Analysis

The data obtained from the questionnaires and observation checklists were analyzed using SPSS version 20.0 software, and then exported to Microsoft Excel to calculate the various scores. Descriptive statistics were used to summarise the variables of interest and determine relationships between them. The results were expressed as mean  $\pm$  standard deviations ( $\pm$ SD), frequencies, and percentages. The Chi-square test was used to test the relationships between the variables. The difference between the variables was considered significant at  $p < 0.05$ .

## 3. Results

### 3.1. Preparation of street beverages

Different beverages were involved in this study included: hot beverages of tea, coffee, milk, coffee with milk or cocoa powder obtained after preparation from vendors with hand push mobile carts. Hot beverages on which the survey was performed were reported in Figure 2.



**Figure 2.** Process of hot beverage preparation by street coffee vendors in disposable plastic cups served to consumers

The first step in preparing and serving hot beverage by street vendors was to put beverage powder in bags in disposable plastic cups. The second step was to add sugar and then hot water in thermos for coffee and selected ingredients to match the needs of consumers (customer). Beverage powder bags of tea, coffee, milk, coffee with milk or cocoa powder were used to prepare ready-to-drink beverages that were served hot to consumers as customers in non-recyclable cups or disposable cups (Figure 2).

### 3.2. Socio-demographic and Cultural Data of Beverage Consumers

Of all hot beverage consumers surveyed, 80.6% were male and 19.4% female. Consumer age ranged from 20 to 34 years (52.6%) was the dominated group. The mean of age was  $28.7 \pm 10.2$  years. They were predominantly Ivorians (59.6%) followed by Malians (11.2%). The other consumer nationalities were Nigerian (9.4%), Guinean (7.2%), Burkinabe (6.6%) and others (5.5%). Among these consumers, more than half were muslims (57.8%) and 37.3% of them were christian. However, consumer education level showed that 37.4% had no grade level and 26.2% had a primary level. All data on the demographic and cultural profile of consumers were reported in Table 1.

### 3.3. Preference Hot Beverages by Consumers

The survey revealed that tea (38.4%) was the most consumed, followed by coffee drinkers (31%), then by coffee with milk (16.6%), milk (10.6%) and finally by cocoa powder (3.2%) beverage (Figure 3).

**Table 1. Socio-demographic and cultural data for hot beverages consumers**

| Characteristics (N=500) | n (%)      | Mean $\pm$ SD   |
|-------------------------|------------|-----------------|
| Sex                     |            |                 |
| Male                    | 403 (80.6) |                 |
| Female                  | 97 (19.4)  |                 |
| Age (year)              |            |                 |
| 5-14                    | 27 (5.4)   |                 |
| 15-19                   | 81 (16.2)  |                 |
| 20-34                   | 263 (52.6) | 28.7 $\pm$ 10.2 |
| 35-49                   | 102 (20.4) |                 |
| > 50                    | 27 (5.4)   |                 |
| Nationality             |            |                 |
| Ivoirian                | 298 (59.6) |                 |
| Guinean                 | 36 (7.2)   |                 |
| Malian                  | 56 (11.2)  |                 |
| Burkinabe               | 33 (6.6)   |                 |
| Nigerien                | 47 (9.4)   |                 |
| Other                   | 27 (5.4)   |                 |
| Religion                |            |                 |
| Muslim                  | 289 (57.8) |                 |
| Christian               | 186 (37.3) |                 |
| Animist                 | 21 (4.2)   |                 |
| Other                   | 2 (0.4)    |                 |
| Education               |            |                 |
| Illiterate              | 187 (37.4) |                 |
| Primary school          | 141 (26.2) |                 |
| Secondary school        | 127 (25.4) |                 |
| University              | 45 (9.1)   |                 |
| Location (communes)     |            |                 |
| Abobo                   | 100 (20)   |                 |
| Adjamé                  | 100 (20)   |                 |
| Yopougon                | 100 (20)   |                 |
| Cocody                  | 100 (20)   |                 |
| Port-Bouet              | 100 (20)   |                 |
| Total                   | 500        |                 |

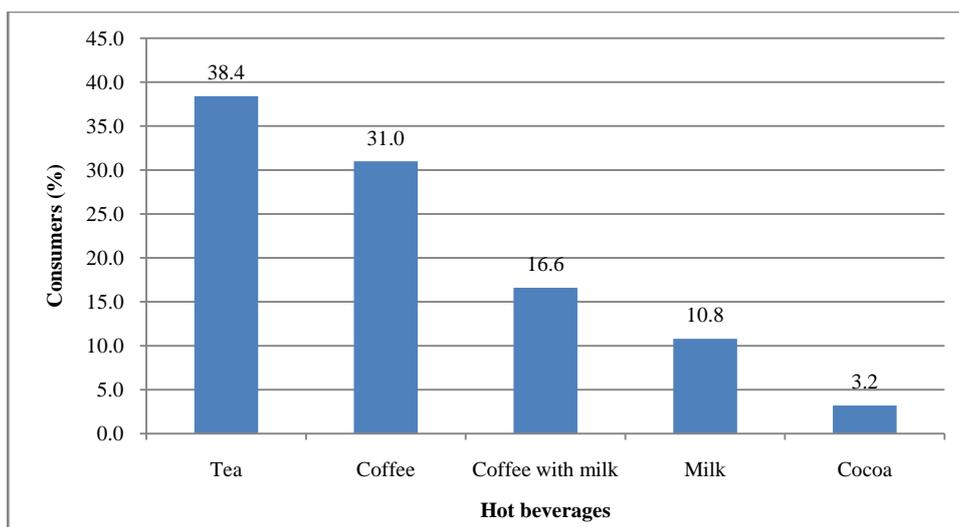


Figure 3. Preferences of hot beverages by consumers

### 3.4. Beverage Consumption by Ages

Beverage consumers aged ranged from 20 to 34 years consumed more tea (20.2%) and coffee (19.4%), followed by 35 to 49 years and 15 to 19 years (Table 2). The difference between all age groups and beverages consumed were statistically significant ( $\chi^2 = 55.015$ ,  $p = 0.000$ ).

### 3.5. Beverage Consumption by Gender

Coffee consumption was dominated by males (36.2%). On the other hand, tea was more popular among female (42.3%) than male (37.5%). Similarly, females preferred consuming coffee with milk (25.8%) than male (14.4%), milk (15.5%) and cocoa powder beverage (7.2%) than males

(2.2%) (Figure 4). The difference between hot beverages and the sex were statistically significant ( $\chi^2 = 33.378$ ,  $p < 0.05$ ).

### 3.6. Some Aspects of Beverage Consumption

The number of cup of beverages consumed can determine the addictive nature of these drinks. Thus, more than half of consumers (50.4%) consumed only one cup per day. 34% of consumers consumed two cups per day and 13% consumed 3 times a day. Coffee intake per day by coffee consumers were generally higher than tea consumers and others beverages (Table 3). The difference between hot beverages and the number of beverage cup consumed per day were statistically significant ( $\chi^2 = 41.032$ ,  $p = 0.004$ ).

Table 2. Beverage consumption by ages

| Beverages    | Coffee (%) | Tea (%)    | Milk (%)  | Coffee with milk (%) | Cocoa powder (%) | Total       |
|--------------|------------|------------|-----------|----------------------|------------------|-------------|
| Ages (years) |            |            |           |                      |                  |             |
| 5-14         | 1 (0.2)    | 5 (1.0)    | 7(1.4)    | 10 (2.0)             | 4 (0.8)          | 27 (5.4)    |
| 15-19        | 16 (3.2)   | 29 (5.8)   | 12 (2.4)  | 18 (3.6)             | 6 (1.2)          | 81 (16.2)   |
| 20-34        | 97 (19.4)  | 101 (20.2) | 24 (4.8)  | 38 (7.6)             | 3 (0.6)          | 263 (52.6)  |
| 35-49        | 33 (6.6)   | 45 (9.0)   | 9 (1.8)   | 13 (2.6)             | 2 (0.4)          | 102 (20.4)  |
| > 50         | 8 (1.6)    | 12 (2.4)   | 2 (0.4)   | 4 (0.8)              | 1 (0.2)          | 27 (5.4)    |
| Total        | 155 (31.0) | 192 (38.4) | 54 (10.8) | 83(16.6)             | 16 (3.2)         | 500 (100.0) |

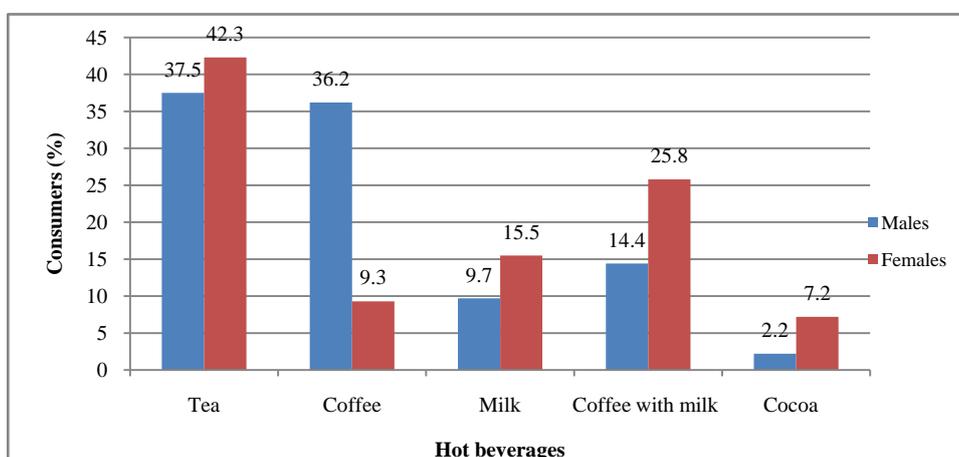


Figure 4. Hot beverage consumption by gender

**Table 3. Some aspects of beverage consumption**

| Hot beverages                           |                         | Coffee (%) | Tea (%)    | Milk (%) | Cocoa powder (%) | Coffee with milk (%) | Total (%)  | p value |
|---|-------------------------|------------|------------|----------|------------------|----------------------|------------|---------|
| Number of beverage cup consumed per day | 1 cup                   | 58 (16.6)  | 100 (20.0) | 27 (5.4) | 12 (2.4)         | 55 (11.0)            | 252 (50.4) | 0.004   |
|   | 2 cups                  | 60 (12.0)  | 64 (12.8)  | 16 (3.2) | 4 (0.8)          | 26 (5.2)             | 170 (34.0) |         |
|   | 3 cups                  | 27 (27.4)  | 25 (5.0)   | 11 (2.2) | 0 (0.0)          | 2 (0.4)              | 65 (13.0)  |         |
|   | 4 cups                  | 6 (1.2)    | 2 (0.4)    | 0 (0.0)  | 0 (0.0)          | 0 (0.0)              | 8 (1.6)    |         |
|   | 5 cups                  | 3 (0.6)    | 1 (0.2)    | 0 (0.0)  | 0 (0.0)          | 0 (0.0)              | 4 (0.8)    |         |
|   | > 6 cups                | 1 (0.2)    | 0 (0.0)    | 0(0.0)   | 0 (0.0)          | 0 (0.0)              | 1 (0.2)    |         |
| Moments of beverage consumption         | Morning                 | 55 (11.0)  | 82 (16.4)  | 21 (4.2) | 8 (1.6)          | 44 (8.8)             | 210 (42.0) | 0.005   |
|   | Midday                  | 4 (0.8)    | 5 (1.0)    | 1 (0.2)  | 0                | 0                    | 10 (2.0)   |         |
|   | Evening                 | 6 (1.2)    | 15 (3.0)   | 3 (0.6)  | 1(0.2)           | 1(0.2)               | 26 (5.2)   |         |
|   | Any time                | 56 (11.2)  | 39 (7.8)   | 17 (3.4) | 3 (0.6)          | 6 (1.2)              | 121 (24.2) |         |
|   | Morning+evening         | 28 (5.6)   | 41 (8.2)   | 7 (1.4)  | 2 (0.4)          | 24 (4.8)             | 102 (20.4) |         |
|   | Morning+Midday          | 1 (0.2)    | 1 (0.2)    | 0        | 0                | 0                    | 2 (0.4)    |         |
|   | Midday+evening          | 1 (0.2)    | 3 (0.6)    | 0        | 0                | 1 (0.2)              | 5 (1.0)    |         |
|   | Morning or evening      | 4 (0.8)    | 6 (1.2)    | 5 (1.0)  | 2 (0.4)          | 7 (1.4)              | 24 (4.8)   |         |
| Preference of drinks served hot or not  | Very hot                | 99 (19.8)  | 126 (25.2) | 32 (6.4) | 5 (1)            | 47 (9.4)             | 309 (61.8) | 0.04    |
|   | Little hot              | 54 (10.8)  | 66 (13.2)  | 20 (4.0) | 11 (2.2)         | 36 (7.6)             | 187(37.4)  |         |
|   | Not hot                 | 1 (0.2)    | 0          | 2 (0.4)  | 0                | 0                    | 3 (0.6)    |         |
|   | Very, little or not hot | 1 (0.2)    | 0          | 0        | 0                | 0                    | 1 (0.2)    |         |

Hot beverages were often consumed in the morning (42.0%) but also at any time (24.2%) by consumers. The difference between hot beverages and moments of beverage consumption were statistically significant ( $\chi^2 = 51.231$ ,  $p = 0.005$ ).

Most of consumers (61.8%) surveyed preferred to be served very hot (Table 3). The difference between hot beverages and preference of drinks served hot or not were statistically significant ( $\chi^2 = 21.781$ ,  $p = 0.04$ ). Hot beverages drunk and preference of drinks served hot or not were significant.

### 3.7. Reasons of Hot Beverage Consumption

The main reason to drink tea was against tiredness by 7.6% of consumers. Coffee was consumed mainly as exciting (16.2%) and coffee with milk against hunger (7.8%) by consumers. Consumers of milk (5.2%) and cocoa powder beverage (2%) were drunk for pleasure, envy or taste (Table 4). The difference between hot beverages and reasons to drink beverages were statistically significant ( $\chi^2 = 337.558$ ,  $p = 0.000$ ).

**Table 4. Reasons of hot beverage consumption**

| Hot beverages                   | Coffee (%) | Tea (%)    | Milk (%)  | Cocoa powder (%) | Coffee with milk (%) | Total (%)  |
|---------------------------------|------------|------------|-----------|------------------|----------------------|------------|
| Reasons of beverage consumption |            |            |           |                  |                      |            |
| For pleasure, envy, taste       | 23 (4.6)   | 32 (6.4)   | 26 (5.2)  | 10 (2)           | 21(4.2)              | 112 (22.4) |
| Against thirsty                 | 2 (0.4)    | 3 (0.6)    | 3 (0.6)   | 0                | 1 (0.2)              | 9 (1.8)    |
| As exciting, fortifying         | 81 (16.2)  | 31 (6.2)   | 2 (0.4)   | 0                | 10 (2)               | 124 (24.8) |
| For digestion                   | 8 (1.6)    | 19 (3.8)   | 0         | 0                | 1 (0.2)              | 28 (5.6)   |
| Against hunger                  | 4 (0.8)    | 4 (0.8)    | 14 (2.8)  | 5 (1)            | 39 (7.8)             | 66 (13.2)  |
| For heath                       | 7 (1.4)    | 28 (5.6)   | 4 (0.8)   | 0                | 2 (0.4)              | 41(8.2)    |
| Against the cold                | 4 (0.8)    | 19 (3.8)   | 5 (1)     | 1 (0.2)          | 5 (1)                | 34 (6.8)   |
| Against tiredness               | 7 (1.4)    | 38 (7.6)   | 0         | 0                | 0                    | 45 (9)     |
| Against sleep                   | 15 (3)     | 4 (0.8)    | 0         | 0                | 3 (0.6)              | 22 (4.4)   |
| To lose weight, for degreasing  | 1 (0.2)    | 12 (2.4)   | 0         | 0                | 0                    | 13 (2.6)   |
| By habit                        | 3 (0.6)    | 2 (0.4)    | 0         | 0                | 1 (0.2)              | 6 (1.2)    |
| Total (%)                       | 155 (31)   | 192 (38.4) | 54 (10.8) | 16 (3.2)         | 83 (16.6)            | 500 (100)  |

**Table 5. Ingredients added to hot beverage consumption**

| Hot beverages                  |                  | Coffee (%) | Tea (%)    | Milk (%)  | Cocoa powder (%) | Coffee with milk (%) | Total (%)  |
|--------------------------------|------------------|------------|------------|-----------|------------------|----------------------|------------|
| No ingredient added            |                  | 15 (3)     | 2 (0.4)    | 10 (2)    | 5 (1.0)          | 22 (10.8)            | 54 (10.8)  |
|                                | Sugar            | 125 (25)   | 42 (4.8)   | 42 (4.8)  | 11 (2.2)         | 59 (11.8)            | 279 (55.8) |
|                                | Lemon            | 0          | 2 (0.4)    | 0         | 0                | 0                    | 2 (0.4)    |
|                                | Mint             | 0          | 0          | 0         | 0                | 2 (0.4)              | 2 (0.4)    |
| Ingredients added to beverages |                  |            |            |           |                  |                      |            |
|                                | Sugar+lemon      | 15 (3.0)   | 122 (24.4) | 0         | 0                | 0                    | 137 (27.4) |
|                                | Sugar+lemon+Mint | 0          | 12 (2.4)   | 0         | 0                | 0                    | 12 (2.4)   |
|                                | Sugar+Mint       | 0          | 12 (2.4)   | 2 (0.4)   | 0                | 0                    | 14 (2.8)   |
| Total (%)                      |                  | 155 (31)   | 192 (38.4) | 54 (10.8) | 16 (3.2)         | 83 (16.6)            | 500 (100)  |

### 3.8. Ingredients Added to Hot Beverage Consumption

Sugar is added by 25% of coffee consumers and 24.4% of tea consumers added sugar with lemon in their beverage before drinking. But 10.8% of coffee with milk consumers preferred not to add ingredient in hot beverages (Table 5). The difference between hot beverages drunk and ingredient added were statistically significant ( $\chi^2 = 254.930$ ,  $p = 0.00$ ).

### 3.9. Hot Beverage Consumption Consequences

Only 5.6% of consumers surveyed reported that they had negative effects such as diarrhea (1.2%), nausea (0.6%), vertigo (0.6%) and hand tremors (0.6%) after consuming hot beverages from street beverage vendors with coffee carts (Table 6).

There were no significant between hot beverages drunk and the presence of disease ( $\chi^2 = 2.257$ ,  $p = 0.689$ ).

The difference between hot beverages consumed and symptoms of hot beverages were not significant ( $\chi^2 = 42.827$ ,  $p = 0.727$ ). There were no significant between hot beverages drunk and those symptoms reported by consumers.

The difference between hot beverages drunk and causes of beverage disease were statistically significant ( $\chi^2 = 23.072$ ,  $p = 0.027$ ).

### 3.10. Health status related to hot beverage consumption

Poor hygiene surrounding the sale and consumption of drinks can cause contamination. Over half of consumers (54.2%) consumed their hot beverage in the street. Majority of consumers (92.4%) surveyed believed that the disposable cups used to serve beverages were clean. But 62.4% were satisfied with the hygienic conditions. Majority of consumers (86.4%) were satisfied with the quality of product sales (Table 7).

**Table 6. Hot beverage consumption in terms of the negative effects of beverage on the body**

|                     | Hot beverages         | Coffee (%) | Tea (%)  | Milk (%) | Coffee with milk (%) | Total (%)  | p value |
|---------------------|-----------------------|------------|----------|----------|----------------------|------------|---------|
| Presence of disease | No                    |            |          |          |                      | 472 (94.6) | 0.689   |
|                     | Yes                   | 8 (1.6)    | 10 (2.0) | 7 (1.4)  | 3 (0.6)              | 28 (5.6)   |         |
| Causes of disease   | Cleanliness (hygiene) | 1 (0.2)    | 3 (0.6)  | 0        | 1 (0.2)              | 5 (1.0)    | 0.027   |
|                     | Disease               | 1 (0.2)    | 5 (1.0)  | 2 (0.4)  | 2 (0.4)              | 10 (2.0)   |         |
|                     | Taste                 | 0          | 1 (0.2)  | 2 (0.4)  | 0                    | 3 (0.6)    |         |
|                     | Dose (excess)         | 6 (1.2)    | 1 (0.2)  | 3 (0.6)  | 0                    | 10 (2.0)   |         |
| Symptoms of disease | Vomiting              | 0          | 3 (0.6)  | 2 (0.4)  | 0                    | 5 (1.0)    | 0.522   |
|                     | Diarrhea              | 0          | 3 (0.6)  | 1 (0.2)  | 2 (0.4)              | 6 (1.2)    |         |
|                     | Nausea                | 0          | 1 (0.2)  | 2 (0.4)  | 0                    | 3 (0.6)    |         |
|                     | Fever                 | 0          | 0        | 1 (0.2)  | 0                    | 1 (0.2)    |         |
|                     | Vertigo               | 1 (0.2)    | 2 (0.4)  | 0        | 0                    | 3 (0.6)    |         |
|                     | Hand tremors          | 3 (0.6)    | 0        | 0        | 0                    | 3 (0.6)    |         |
|                     | Addiction             | 1 (0.2)    | 0        | 0        | 0                    | 1 (0.2)    |         |
|                     | Abdominal pain        | 0          | 1 (0.2)  | 0        | 1 (0.2)              | 2 (0.4)    |         |
|                     | Ulcer                 | 1 (0.2)    | 0        | 0        | 0                    | 1 (0.2)    |         |
|                     | Bloated stomach       | 0          | 0        | 1 (0.2)  | 0                    | 1 (0.2)    |         |
| Insomnia            | 1 (0.2)               | 0          | 0        | 0        | 1 (0.2)              |            |         |
| Headache            | 1 (0.2)               | 0          | 0        | 0        | 1 (0.2)              |            |         |

**Table 7. Observed of street hot beverage handling behavior by consumers and hygienic conditions surrounding the consumption**

| Observed and question item to consumers                             | Yes (%) | No (%) | Not always (%) |
|---|---------|--------|----------------|
| Place of consumption  |         |        |                |
| Street corner or street crossroads                                  | 54.2    |        |                |
| Near market   | 15.4    |        |                |
| Near car station or bus terminals                                   | 15.2    |        |                |
| Near school   | 9.0     |        |                |
| Other   | 6.2     |        |                |
| Consumers washed their hands before or after drinking hot beverages | 0       | 100    |                |
| Cleanliness of disposable cups used to serve hot beverages          | 92.4    | 4.8    | 2.8            |
| Satisfaction with hygienic conditions of sale                       | 62.4    | 13.6   | 24.0           |
| Satisfaction with the quality of product sales                      | 86.4    | 8.0    | 5.6            |

## 4. Discussion

The survey showed that the first step in preparing and serving teas or coffees is to select the necessary ingredient equipment and serveware. In Figure 2, our study revealed the process of beverage preparation of street beverage vendors with hand push mobile carts. Beverage powder products of tea, coffee, milk, coffee with milk or cocoa powder in bag are used to prepare ready-to-drink beverages that are served hot to consumers. When asked to choose a beverage to drink, people are likely to choose the one that tastes better, because taste is directly related to the process of consumption. The caffeine content of tea and coffee may vary by a factor of ten depending on the method of preparation [17,18]. Consequently caffeine exposures will vary with the concentration data used [19]. It is important to prepare teas and coffees using the correct method for the drink ordered by the customer in accordance to [20]. Many people can choose between coffee and tea, and drink these in varying ratios depending on taste preference, lifestyle, socio-economic factors, genetics and health [10].

Some ingredients such as lemon, mint or sugar were added to hot beverages during the preparation in accordance to the taste of consumer. The reference [21] reported that street food safety is influenced starting from the quality of raw materials to food processing and storing and similar steps in the process. Besides the fact that raw materials used in these products are poor quality, these foods are stored under wrong and unsafe conditions for a long time. Selling points of street food have a limited infrastructure as regards to clean drinking water, toilets, freezing-ice creams, disinfection, hand washing, and removal of wastes. In most cases, since water does not come from taps constantly, water storage is required and this kind of water is not appropriate for hand or dish washing, cooking, or drinking, and contamination factors occur. Besides, street food is subject to the contact of insects, rodents, domestic and other animals and unfavorable environmental conditions like air pollution [22].

Our study revealed that active population ranged from 20 to 34 years consumed more hot beverage with street vendors with coffee carts compared to other ranged ages. For [23], in today's world, people prefer to buy food sold on the streets to meet their nutrition needs outside home. Street foods are being prepared and sold at places like streets, near schools, train or car stations, bus terminals, entertainment and festival areas where people are crowded or worked. These foods are drinks can be consumed in the run without requiring any processing or preparation afterwards [3,24]. Street foods are highly demanded both by the sellers and consumers because of their tastes, easy availability, low cost, cultural and social heritage connection, and being nutritional [25,26]. According to [23], street foods especially show the eating habits of people living in big cities such as Abidjan. Approximately 2.5 billion people around the world consume street food every day. Street food is preferred by consumers, especially students, because of its delicious taste, accessibility, variety, and cheapness [27].

Our study revealed that tea (38.4%) was the most consumed hot beverage in the five communes of Abidjan

city, followed by coffee (31%). According to [4], tea is the most frequently consumed beverage in the world after water. Tea is the most devoured non-alcoholic refreshment on the planet [5] with an estimated daily consumption of 15-20 billions cups [6]. Like in Abidjan city, tea (black or green) is worldwide the most commonly consumed beverage after water, with high per capita consumption observed in Turkey, Iran, and United Kingdom [28].

The main reason to drink tea added with sugar and lemon was against tiredness for 7.6% of hot beverage drinkers. For [6], this is due to its refreshing, mild stimulant properties, and also to its medicinal and general health-promoting purposes. After tea, coffee was the second beverage consumed by Abidjan population. The reference [6] found out that coffee is one of the most popular beverages consumed worldwide, with a global production output of *ca.* 7 million tons in 2010, compared to 6.7 million tons in 1998-2000. People drink coffee to relax and enjoy its diverse favours and aromas. It has physiological and psychological effects beyond its nutritional benefits [9]. Coffee typically contains more caffeine than most other beverages, and is widely and frequently consumed [7,8]. Thus, it contributes significantly more to overall caffeine consumption within the population, particularly in adults [14].

Coffee was consumed mainly with sugar as exciting by 16.2% of consumers. The reference [9] also reported that people drink coffee to relax and enjoy its diverse favours and aromas. It has physiological and psychological effects beyond its nutritional benefits [9]. Improvements in mental alertness, concentration, fatigue, and athletic performance are well documented benefits [29]. Caffeine is a psychoactive stimulant known to increase alertness, elevate mood and give temporary energy boost thereby easing fatigue [1]. The reference [30] also reported that coffee has a relaxing effect and it alleviates stress. In the study of [31], majority of the 100 subjects found the tested coffee-flavored iced dessert pleasant, on the basis of the Organoleptic-Sensorial Questionnaire, in terms of taste, aspect, texture, and smell. Caffeine is also consumed widely for its stimulatory effects of enhancing wakefulness, mood, physical endurance and mental concentration, and decreasing the sensation of fatigue [19,32].

In our study, we found that milk and cocoa powder beverage were consumed for pleasure, envy or for taste. The reference [6] reported that the two distinguishing and pleasurable characteristics of chocolate are the flavor and texture. Chocolate is consumed by almost everyone globally and is considered an enjoyable food [6]. According to our study, cocoa powder beverage was weakly consumed by Abidjan population. But for [33], cocoa products are favorably consumed nutrients worldwide. Coffee, tea, cocoa are familiar beverages for people in Arabic and North African countries [13].

Table 2 shows that young beverage consumers aged ranged from 20 to 34 years consumed more tea (20.2%) and coffee (19.4%). Several studies also show that such drinks may be more commonly consumed by young adults, teenagers, college students, athletes, and military personnel [34]. Our study revealed that coffee products were generally used in higher amounts per day than tea product. Whereas, to [1] study, cocoa products are

generally used in higher amounts per cup of beverage than coffee products.

This study revealed that coffee consumption was dominated by males (36.2%) and tea was more popular among females (42.3%) than males (37.5%). In the study of [35], people drink coffee for different reasons, and these reasons may differ between males and females, young males consumed more coffee than young females. The reference [36] reported gender as a factor influencing nutrient consumption. The reference [37] demonstrated that females have higher interest in the nutrients than males.

Only 5.6% of consumers reported that they had negative effects such as diarrhea (1.2%) and nausea, vertigo, hand tremors (0.6%) after consuming hot beverage from street beverage vendors with coffee mobile cart. For [37], today millions of people catch diseases originating from food sources and thousands of deaths occur in world. The wide consumption of street food around the world increase the importance of safety and health issues [23]. Street foods are not reliable, they also carry diseases originating from food sources in many countries [39,40]. Street foods are preferred by people in many countries because of their variety, cheapness and availability. There are many studies about relation of street food and diseases, because of lack of knowledge about hygiene, and food safety of street food seller's and the excess of infective bacteria in street food samples [24].

## 5. Conclusion

To our knowledge, this is the first reported study for five beverage consumption from street vendors with hand push mobile carts. This study was conducted to assess the knowledge of hot beverages of coffee, tea, milk, coffee with milk or cocoa powder sold by street vendors with mobile coffee carts and the characteristics of its consumption as street food in Abidjan city. It is shown from the results of this study that hot beverages tea and coffee were widely consumed by the public, especially younger of active population. So, it is important to prepare teas and coffees using the correct method for the drink ordered by the customer.

Although hot beverages were consumed hot, consumers should pay attention before paying and drinking hot beverages with street vendors with hand push mobile carts. Street hot beverage vendors training on hygienic habits could urgently promote higher food chain safety standards.

## Conflict of Interest

The authors declare that there are no conflicts of interest.

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