

**FOOD SAFETY PRACTICES, KNOWLEDGE OF STREET FOOD VENDORS IN THE STATE OF KHARTOUM -SUDAN - A CROSS-SECTIONAL STUDY****\*Dr. Mona Adelgadir Ahmed Abuagla and Ibdaa Dawood fatani**

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**Abstract**

The objective was to evaluate Health Knowledge and Practices Among Street Food Vendors In Khartoum State- Sudan. The descriptive cross-sectional study that was carried out, from May 1st,2021 to May 1st, 2022, to assess the knowledge and practices related to food safety among those who sell it on the streets in the 3 cities of Khartoum State, By means of a pretested questionnaire. In addition to making observations about certain topics that were not addressed during the in-depth interviews. 1581 workers from a variety of locations participated in the questionnaire, including Nile Street, street sellers, marketplaces, and areas close to hospitals, schools, bus stations, entertainment venues, and other locations. Of them, (44.4%) were men and 55.6% were women. They operate in the food and beverage preparation. The majority of whom are between the ages of 28 - 37, 37.7% know just a little bit about food safety protocols.

**Keywords:** Knowledge, Food safety Practices, Street Food vendors, Khartoum-Sudan.

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**INTRODUCTION**

Foods and beverages prepared and sold in and around public locations in temporary structures are referred to as street-vended foods. Such meals is less expensive than restaurant food (Hill *et al.*, 2019). Street food is defined by the Food and Agriculture Organization of the United Nations as ready-to-eat food and drinks that are produced and sold by street sellers. public highways and comparable locations (FAO, F. 1993). The World Health Organization has provided a different description, classifying these foods according to the setting in which they are cooked. This includes all foods that are immediately prepared and ready for eating. (WHO, 2010), Most cities and towns in developing nations have street food vendors. According to a World Health Organization estimate, consuming unfit food results in around 600 million occurrences of food-borne illnesses and 420,000 fatalities annually, with 125,000 of those deaths occurring in children under the age of five. It puts more strain on certain nations, particularly those in Africa and Southeast Asia, in areas like health and the economy (Andrade *et al.*,2023, & Faour-Klingbeil, *et al* 2020). In the majority of developing nations, street food vendors operate largely outside of official regulations and protection. Due to the informal nature of the business and the lack of public data on the volume of commerce engaged, the economic significance of the operations is not well understood (Alimi *et al.*, 2016). Selling prepared foods or those made on the spot is a long-standing practice with implications for culture, society, and the economy. Since most of it is not registered using official channels and is carried out with little infrastructure, most of it is done outside the purview of government work systems or the unofficial sector (Schindler, 2014).

This makes it possible to define three main categories of street vendors: semi-fixed street vendors, who temporarily set up their improvised structures along the street to dispose of their goods, fixed-stall or stationary vendors, who work in a stable location throughout the working day, and mobile or itinerant vendors, who carry out their activities by moving to different places throughout the working day (Coletto, 2019). Microbial foodborne disease is a significant global health issue linked to food safety and a major contributing factor. street foods are typically cooked and served in unsanitary settings, with little access to safe water, sanitary services, or garbage disposal facilities a leading cause of death in underdeveloped nations. Therefore, eating food from the street increases your chance of contracting food poisoning from microbiological contamination, inappropriate use of food additives, adulteration, and environmental pollution (WHO, 2003). Foods and food items may have bacteria that cause food poisoning, which can result in intoxication or a food-borne infection. It is the source of infection. Pathogenic *Escherichia Coli*, *Bacillus Cereus*, *Salmonella*, and other microorganisms. Toxins generated in food by bacteria such as *Clostridium Botulinum* and *Staphylococcus Aureus* cause intoxication (Pinogaret *al.*, 1985). However, due to incorrect handling and serving procedures, street foods are commonly linked to diarrheal illnesses. Those who rely on them are more concerned with the food's convenience than its quality, safety, or hygienic conditions, It has become a staple of urban life in both big cities and little towns, and it is always evolving and enticing onlookers. Street food vendors frequently lack formal education, are unskilled in food hygiene, labour in harsh, unhygienic environments, and know very little to nothing about the causes of food-borne illnesses (Barroet *al.*, 2006). The street food industry plays an important role in meeting the food requirements of urban dwellers in many cities and towns of developing countries and the industry feeds

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millions of people daily with a wide variety of foods that are relatively cheap and easily accessible. So that, food borne illnesses of microbial origin are a major health problem associated with street foods (Nicolas *et al.*, 2007). Some of the main sources of food contamination in street vending are improper storage temperatures, improper processing techniques, and inadequate personal hygiene practices of food handlers. When it comes to street food, consumers who rely on it are typically more concerned with its convenience than its quality, safety, or hygiene. The temperatures used in the frying and cooking processes for preparing street food are high enough to kill vegetative cells, but the microorganisms' resistant spores might survive (Bryan, *et al.*, 1988). However, the methods used in the preparation, handling, and selling of street food put it at risk for cross-contamination, recontamination, and the spread of pathogens and food-borne disorders. Prior to retailing, most items for street vending are often produced in large quantities at various periods (Nicolas, *et al.*, 2007). Around 2.5 billion people worldwide eat street food every day (Sezgin *et al.*, 2016).

## MATERIALS AND METHODS

Through the use of a questionnaire-based survey, this cross-sectional descriptive study aimed to assess street sellers' awareness of food safety protocols among Khartoum state citizens between may 2021 and may 2022. Fifteen hundred eighteen male and female individuals, randomly selected from various locations, participated in the study. Various occupations, and they all share the trait of being street vendors. Street sellers either filled out the questionnaire themselves or had those who were illiterate fill it out after being told all the questions. Those who did not want to participate were not included. Five axes were included in the questionnaire: participant characteristics, such as age, gender, marital status, occupation, and level of education. Inquiries concerning safe food handling techniques are included on a separate axis. The third axis covers the well-being of the workplace, employee health, and traders' level of food safety expertise. Using spss version 22, the items were labeled, analyzed using frequencies, and cross tabulated using the Likert scale, observation. Subheadings should be used

## RESULTS AND DISCUSSION

The result: After collecting the data, it was analysed and placed in tables as follow

**Table 1. Demographic Characteristic of the participants, {N=1581}**

| Variables |                                  | Frequency                          | Percentage % | Valid Percent | Cumulative Percent |       |
|-----------|----------------------------------|------------------------------------|--------------|---------------|--------------------|-------|
| 1         | Gender                           | Male                               | 702          | 44.4          | 43                 | 44.4  |
|           |                                  | Female                             | 879          | 55.6          | 57                 | 100.0 |
|           | total                            | 1581                               | 100.0        | 100.0         |                    |       |
| 2         | Age distributions/years          | <18                                | 41           | 2.6           | 2.6                | 2.6   |
|           |                                  | 18-27                              | 570          | 36            | 36                 | 38.6  |
|           |                                  | 28-37                              | 577          | 36.5          | 36.5               | 75.1  |
|           |                                  | 38-47                              | 320          | 20.2          | 20.2               | 95.3  |
|           |                                  | 48-57                              | 42           | 2.7           | 2.7                | 98    |
|           |                                  | >57                                | 31           | 2             | 2                  | 100.0 |
| Total     |                                  | 1581                               | 100.0        | 100.0         |                    |       |
| 3         | Type of work                     | Sale for tea                       | 478          | 30.2          | 30.2               | 30.2  |
|           |                                  | Sale for tradition food            | 233          | 14.7          | 14.7               | 44.9  |
|           |                                  | Sale for juices & sweets           | 229          | 14.5          | 14.5               | 59.4  |
|           |                                  | Sandwiches (Falafel & meat)        | 234          | 14.8          | 14.8               | 74.2  |
|           |                                  | Snacks                             | 222          | 14            | 14.1               | 88.3  |
|           |                                  | Vegetables & fruits                | 87           | 5.5           | 5.5                | 93.8  |
|           |                                  | Grilled                            | 98           | 6.2           | 6.2                | 100.0 |
| Total     |                                  | 1581                               | 100.0        | 100.0         |                    |       |
| 4         | Education level of Participant's | University                         | 366          | 23.2          | 23.2               | 23.2  |
|           |                                  | Secondary                          | 550          | 34.8          | 34.8               | 58    |
|           |                                  | primary                            | 427          | 27.0          | 27.0               | 85    |
|           |                                  | Kalwa                              | 147          | 9.3           | 9.3                | 94.3  |
|           |                                  | illiterate                         | 91           | 5.7           | 5.7                | 100.0 |
| Total     |                                  | 1581                               | 100.0        | 100.0         |                    |       |
| 5         | Residence                        | Village                            | 669          | 42.3          | 42.3               | 42.3  |
|           |                                  | City                               | 912          | 57.7          | 57.7               | 100.0 |
|           | Total                            |                                    | 1581         | 100.0         | 100.0              |       |
| 6         | Marital status                   | Married                            | 851          | 53.8          | 53.8               | 53.8  |
|           |                                  | single                             | 370          | 23.4          | 23.4               | 77.2  |
|           |                                  | Divorce                            | 204          | 12.9          | 12.9               | 90.1  |
|           |                                  | Widower                            | 156          | 9.9           | 9.9                | 100.0 |
| Total     |                                  | 1581                               | 100.0        | 100.0         |                    |       |
| 7         | Year of Experience               | ≤3 years                           | 789          | 49.9          | 49.9               | 49.9  |
|           |                                  | More than 3 years                  | 792          | 50.1          | 50.1               | 100   |
|           | Total                            |                                    | 1581         | 100           | 100                |       |
| 8         | Place of work                    | Nile Beach                         | 263          | 16.6          | 16.6               | 16.6  |
|           |                                  | Inside the neighborhood            | 184          | 11.6          | 11.6               | 28.2  |
|           |                                  | Inside the markets                 | 400          | 25.3          | 25.3               | 53.5  |
|           |                                  | near to an educational institution | 158          | 10            | 10                 | 63.5  |
|           |                                  | Near to hospitals                  | 120          | 7.6           | 7.6                | 71.1  |
|           |                                  | Transportation station             | 253          | 16            | 16                 | 87.1  |
|           |                                  | Recreational area                  | 63           | 4             | 4                  | 91.1  |
|           |                                  | Others                             | 140          | 8.9           | 8.9                | 100.0 |
| Total     |                                  | 1581                               | 100.0        | 100.0         |                    |       |
|           | Take food hygiene training       | Yes                                | 692          | 43.8          | 43.8               | 43.8  |
|           |                                  | No                                 | 889          | 56.3          | 56.3               | 100.0 |
| Total     |                                  | 1581                               | 100.0        | 100.0         |                    |       |

Table 2. Street food &amp; hygiene practices, {N=1581}

| Variables |  | Frequency                           | Percentage% | Valid Percent | Cumulative Percent |       |
|-----------|--|-------------------------------------|-------------|---------------|--------------------|-------|
| 1         | FoodorDrink equipment's used                   | Plastic                             | 501         | 31.7          | 31.7               | 31.7  |
|           |  | Recycled Paper                      | 401         | 25.4          | 25.4               | 57.1  |
|           |  | Glass                               | 300         | 18.9          | 18.9               | 82.6  |
|           |  | Othermotsuitable equipment's        | 105         | 6.6           | 6.6                | 63.7  |
|           |  | Othersuitable equipment's           | 275         | 17.4          | 17.4               | 100   |
| Total     |  | 1581                                | 100         | 100           |                    |       |
| 2         | Usinggloves duringfood handling                | Yes                                 | 621         | 39.3          | 39.3               | 39.3  |
|           |  | No                                  | 960         | 60.7          | 60.7               | 100   |
| Total     |  | 1581                                | 100         | 100           |                    |       |
| 3         | Wearappropriateclothing while working          | Yes                                 | 670         | 42.4          | 42.4               | 42.2  |
|           |  | No                                  | 318         | 20.2          | 20.2               | 62.6  |
|           |  | Sometimes                           | 593         | 37.5          | 37.5               | 100   |
| Total     |  | 1581                                | 100         | 100           |                    |       |
| 4         | Use aheadcovering                              | Yes                                 | 742         | 46.9          | 46.9               | 46.9  |
|           |  | No                                  | 839         | 53.1          | 53.1               | 100   |
| Total     |  | 1581                                | 100         | 100           |                    |       |
| 5         | Food storage equipment's                       | Suitable                            | 581         | 36.7          | 36.7               | 36.7  |
|           |  | Not suitable                        | 600         | 38            | 38                 | 74.7  |
|           |  | Nothing to store                    | 400         | 25.3          | 25.3               | 100   |
| Total     |  | 1581                                | 100         | 100           |                    |       |
| 6         | Leftoverfoodmanagement(If it exists )          | It isdisposedof                     | 850         | 53.8          | 53.8               | 53.8  |
|           |  | Soldagainthentheextime              | 731         | 46.2          | 46.2               | 100   |
| Total     |  | 1581                                | 100         | 100           |                    |       |
| 7         | Repeatfryingoil                                | Once                                | 377         | 23.8          | 23.8               | 23.8  |
|           |  | twice                               | 771         | 48.8          | 48.8               | 72.6  |
|           |  | Morethan twice                      | 433         | 27.4          | 27.4               | 100   |
|           |  | Total                               | 1581        | 100           | 100                |       |
| 8         | Methodofwashing utensils                       | ByTapwater                          | 650         | 41.1          | 41.1               | 41.1  |
|           |  | Insidethecontainer containing water | 451         | 28.5          | 28.5               | 69.6  |
|           |  | No anything to wash                 | 480         | 30.4          | 30.4               | 100   |
| Total     |  | 1581                                | 100         | 100           |                    |       |
| 9         | Handlingmoneyisthesame as handling food        | Yes                                 | 742         | 46.9          | 46.9               | 46.9  |
|           |  | No                                  | 600         | 38            | 38                 | 84.9  |
|           |  | Not always                          | 239         | 15.1          | 15.1               | 100.0 |
| Total     |  | 1581                                | 100         | 100           |                    |       |
| 10        | Howoften isthewater cleaning? Utensil changed? | Once                                | 151         | 9.6           | 9.6                | 9.6   |
|           |  | twice                               | 200         | 12.7          | 12.7               | 22.3  |
|           |  | Until finished                      | 100         | 6.3           | 6.3                | 28.6  |
|           |  | Nothing to washed                   | 480         | 30.4          | 30.4               | 59    |
|           |  | Using tabwater                      | 650         | 41            | 41                 | 100   |
| Total     |  | 1581                                | 100         | 100           |                    |       |
| 11        | Correctfoodstorage Procedures                  | Good procedure                      | 430         | 27.2          | 27.2               | 27.2  |
|           |  | Moderate                            | 387         | 24.5          | 24.5               | 51.7  |
|           |  | Poor                                | 309         | 19.5          | 19.5               | 71.2  |
|           |  | No anything to storage              | 455         | 28.8          | 28.8               | 100   |
| Total     |  | 1581                                | 100         | 100           |                    |       |
| 12        | Use of detergents                              | Yes                                 | 622         | 39.3          | 39.3               | 39.3  |
|           |  | No                                  | 451         | 28.5          | 28.5               | 67.8  |
|           |  | Sometimes                           | 508         | 32.1          | 32.1               | 100   |
| Total     |  | 1581                                | 100         | 100           |                    |       |
| 13        | Easytocleansurfaces                            | Easytoclean                         | 541         | 34.2          | 34.2               | 34.2  |
|           |  | Difficultyincleaning                | 521         | 33            | 33                 | 67.2  |
|           |  | Worn surfaces                       | 519         | 32.8          | 32.8               | 100   |
| Total     |  | 1581                                | 100         | 100           |                    |       |
| 14        | Shortcleanfingernails                          | Yes                                 | 920         | 58.2          | 58.2               | 58.2  |
|           |  | No                                  | 661         | 41.8          | 41.8               | 100.0 |
| Total     |  | 1581                                | 100         | 100           |                    |       |
| 15        | Smoking while working with food                | Yes                                 | 502         | 31.8          | 31.8               | 31.8  |
|           |  | No                                  | 500         | 31.7          | 31.7               | 63.5  |
|           |  | Some times                          | 579         | 36.7          | 36.7               | 100.0 |
| Total     |  | 1581                                | 100.0       | 100.0         |                    |       |
| 16        | Airisblownintothebag before filling            | Yes                                 | 522         | 33.1          | 33.1               | 33.1  |
|           |  | No                                  | 701         | 44.3          | 44.3               | 44.3  |
|           |  | Some time                           | 358         | 22.6          | 22.6               | 100.0 |
| Total     |  | 1581                                | 100.0       | 100.0         |                    |       |
| 17        | Food preparation                               | Sameplacesasfood display            | 750         | 47.5          | 47.5               | 47.5  |
|           |  | At home                             | 531         | 33.6          | 33.6               | 81    |
|           |  | Repreparationof foods               | 300         | 19.0          | 19.0               | 100.0 |
| Total     |  | 1581                                | 100.0       | 100.0         |                    |       |

**Table 3. The environment in which food vendors work, {N=1581}**

| Variables                          |  | Frequency   | Percentage% | Valid Percent | Cumulative Percent |
|------------------------------------|--|---|-------------|---------------|--------------------|
| 1                                  | Sale place structure                                 | Kiosk on the road                                 | 566         | 35.8          | 35.8               |
|                                    |  | Mobile truck                                      | 444         | 28.1          | 28.1               |
|                                    |  | Open trays  | 571         | 36.1          | 36.1               |
|                                    | total  | 1581  | 100.0       | 100.0         |                    |
| 2                                  | Distance of street food outlet from the garbage dump | Close to the place                                | 599         | 37.9          | 37.9               |
|                                    |  | Something far away                                | 401         | 25.4          | 25.4               |
|                                    |  | So far  | 581         | 36.7          | 36.7               |
|                                    | Total  | 1581  | 100.0       | 100.0         |                    |
| 3                                  | The presence of rodents and insects                  | Yes   | 511         | 32.3          | 32.3               |
|                                    |  | No  | 1070        | 67.7          | 67.7               |
| Total                              | 1581   | 100.0   | 100.0       |               |                    |
| 4                                  | Source of water supply                               | There is a continuous public water source (tap)   | 710         | 44.9          | 44.9               |
|                                    |  | There is a limited container for water (Jerkana)  | 871         | 55.1          | 55.1               |
|                                    | Total  | 1581  | 100.0       | 100.0         |                    |
| 5                                  | Methods of waste collection in workplaces            | There is no waste collection                      | 549         | 34.7          | 34.7               |
|                                    |  | There is a basket for throwing waste in the place | 431         | 27.3          | 27.3               |
|                                    |  | There are only plastic bags                       | 601         | 38.           | 38.                |
|                                    | Total  | 1581  | 100.0       | 100.0         |                    |
| 6                                  | A suitable place to wash utensils and hands          | There is a suitable place                         | 510         | 32.3          | 32.3               |
|                                    |  | There is no suitable place                        | 1071        | 67.7          | 67.7               |
|                                    | Total  | 1581  | 100.0       | 100.0         |                    |
| 7                                  | Having suitable bathroom                             | There is a suitable bathroom                      | 636         | 40.2          | 40.2               |
|                                    |  | There is no suitable bathroom                     | 445         | 28.2          | 28.2               |
|                                    |  | Public toilets                                    | 500         | 31.6          | 31.6               |
|                                    | Total  | 1581  | 100.0       | 100.0         |                    |
| 8                                  | Food preparation place                               | Same place as food display                        | 850         | 53.8          | 53.8               |
|                                    |  | At home   | 731         | 46.2          | 46.2               |
|                                    | Total  | 1581  | 100.0       | 100.0         |                    |
| Exposure to the environmental dust | Yes  | 410   | 25.3        | 25.3          |                    |
|                                    | No   | 500   | 38          | 38            |                    |
|                                    | Sometimes  | 580   | 36.7        | 36.7          |                    |
| Total                              | 1581   | 100.0   | 100.0       |               |                    |

**Table 4. Street Food vendors Health , {N=1581}**

| Variables |   | Frequency            | Percentage % | Valid Percent t | Cumulative Percent |
|-----------|---|----------------------|--------------|-----------------|--------------------|
| 1         | Validity of the health license                                | Valid                | 521          | 33.0            | 33.0               |
|           |   | Not valid            | 536          | 33.9            | 33.9               |
|           |   | Not found            | 524          | 33.2            | 33.2               |
|           | Total   | 1581                 | 100.0        | 100.0           |                    |
| 2         | Visit health inspectors                                       | Regular visits       | 541          | 34.2            | 34.2               |
|           |   | very frequent visits | 432          | 27.3            | 27.3               |
|           |   | no visits            | 331          | 20.9            | 20.9               |
|           |   | Not surer            | 277          | 17.5            | 17.5               |
|           | Total   | 1581                 | 100.0        | 100.0           |                    |
| 3         | Suspension from work by health authorities                    | Yes                  | 441          | 27.9            | 27.9               |
|           |   | No                   | 661          | 41.8            | 41.8               |
|           |   | Not surer            | 479          | 30.3            | 30.3               |
|           | Total   | 1581                 | 100.0        | 100.0           |                    |
| 4         | Staying away from work due to illness                         | Yes                  | 345          | 21.8            | 21.8               |
|           |   | No                   | 700          | 44.3            | 44.3               |
|           |   | Not sure             | 536          | 33.9            | 33.9               |
|           | Total   | 1581                 | 100.0        | 100.0           |                    |
| 5         | Previous occurrence of food poisoning                         | Yes                  | 174          | 11              | 11                 |
|           |   | No                   | 766          | 48.5            | 48.5               |
|           |   | Not sure             | 640          | 40.5            | 40.5               |
|           | Total   | 1581                 | 100.0        | 100.0           |                    |
| 6         | Taking vaccinations   | Yes                  | 677          | 42.8            | 42.8               |
|           |   | No                   | 904          | 57.2            | 57.2               |
|           | Total   | 1581                 | 100.0        | 100.0           |                    |
| 7         | Giving food safety advice from health inspectors              | Yes                  | 495          | 31.3            | 31.3               |
|           |   | No                   | 866          | 54.8            | 54.8               |
|           |   | Not sure             | 220          | 13.9            | 13.9               |
|           | Total   | 1581                 | 100.0        | 100.0           |                    |
| 8         | The food was previously confiscated due to a health violation | Yes                  | 456          | 28.8            | 28.8               |
|           |   | No                   | 489          | 30.9            | 30.9               |
|           |   | Not sure             | 636          | 40.2            | 40.2               |
|           | Total   | 1581                 | 100.0        | 100.0           |                    |
| 9         | Environmental Health  | Good                 | 453          | 28.7            | 28.7               |
|           |   | Moderate             | 617          | 39              | 39                 |
|           |   | Poor                 | 511          | 32.3            | 32.3               |
|           |   | 1581                 | 100.0        | 100.0           |                    |
|           | Total   |                      |              |                 |                    |
| 10        | Currently suffering from any infectious disease               | Yes                  | 224          | 14.2            | 14.2               |
|           |   | No                   | 775          | 49              | 49                 |
|           |   | Not sure             | 582          | 36.8            | 36.8               |
|           | Total   | 100.0                |              |                 |                    |
| Total     | 1581  | 100.0                | 100.0        |                 |                    |
| 11        | Environmental health inspection audit                         | No                   | 603          | 38.3            | 38.3               |
|           |   | Not sure             | 470          | 29.8            | 29.8               |
|           | Total   | 100.0                | 100.0        | 100.0           |                    |

Table 5. Quantitative and qualitative analysis of questions about participants' knowledge about the health of foods, {N=1581}

| No  | Questions  | Good | Moderate           | Poor e     | Sample size      | Mean | Standard deviation | Percentage | Sample direction |
|---|--|------|--------------------|------------|------------------|------|--------------------|------------|------------------|
| 1.  | Personal hygiene importance  | 700  | 567                | 314        | 1581             | 2.24 | 0.76               | 74.67      | moderate         |
| 2.  | Types of foodborne diseases  | 501  | 651                | 429        | 1581             | 2.05 | 0.77               | 68.33      | Moderate         |
| 3.  | The importance of washing hands  | 822  | 480                | 279        | 1581             | 2.34 | 0.76               | 78         | good             |
| 4.  | The importance of changing gloves  | 412  | 560                | 609        | 1581             | 1.88 | 0.79               | 62.67      | moderate         |
| 5.  | Symptoms of food poisoning   | 788  | 440                | 353        | 1581             | 2.28 | 0.8                | 76         | moderate         |
| 6.  | Modes of transmission of food borne diseases                               | 610  | 620                | 351        | 1581             | 2.16 | 0.76               | 72         | moderate         |
| 7.  | Sources of food contamination  | 420  | 780                | 381        | 1581             | 2.02 | 0.71               | 67.33      | moderate         |
| 8.  | Food safety principles   | 443  | 603                | 535        | 1581             | 1.94 | 0.78               | 64.67      | moderate         |
| 9.  | The importance of appropriate clothing                                     | 621  | 609                | 351        | 1581             | 2.17 | 0.77               | 72.33      | moderate         |
| 10.   | The importance of appropriate utensils for each type of food               | 549  | 444                | 588        | 1581             | 1.98 | 0.85               | 66         | moderate         |
| 11.   | The importance of keeping some patients out of work                        | 561  | 583                | 437        | 1581             | 2.08 | 0.79               | 69.33      | moderate         |
| 12.   | The importance of environmental health                                     | 880  | 301                | 400        | 1581             | 2.3  | 0.85               | 76.67      | moderate         |
| 13.   | Knowledge about correct food storage procedures                            | 601  | 754                | 226        | 1581             | 2.24 | 0.68               | 74.67      | moderate         |
| 14.   | The importance of cleanliness and sterilization of a place that sells food | 544  | 651                | 386        | 1581             | 2.1  | 0.76               | 70         | moderate         |
| 15.   | Separation of raw food from cooked food                                    | 501  | 567                | 513        | 1581             | 1.99 | 0.8                | 66.33      | moderate         |
| The overall average for the axis as a whole |  | Mean | Standard deviation | Percentage | Sample direction |      |                    |            |                  |
|   |  | 2.12 | 0.79               | 70.67      | Moderate         |      |                    |            |                  |

Table 6. Type of work within gender

| Variables                  |                 | Count & % within gender |             | Total        |
|----------------------------|-----------------|-------------------------|-------------|--------------|
|                            |                 | Female                  | Male        |              |
| Type of work               | Tea             | 289(32.9%)              | 189(26%)    | 478 (30.2%)  |
|                            | Tradition food  | 154(17.5%)              | 79(11.3%)   | 233(14.7%)   |
|                            | Juices & sweets | 128(14.6%)              | 101(14.4%)  | 229(14.5%)   |
|                            | Sandwiches      | 150(17.1%)              | 84(12.0%)   | 234(14.8%)   |
|                            | Snacks          | 101(11.5%)              | 121(17.2%)  | 222(14.0%)   |
|                            | Vegetables      | 29(3.3%)                | 58(8.3%)    | 87(5.5%)     |
|                            | Grilled         | 28(3.2%)                | 70(10.0%)   | 98(6.2%)     |
| Total                      |                 | 879(100.0%)             | 702(100.0%) | 1581(100.0%) |
| Chi-square test sig < .000 |                 | (Approx. Sig 0.000)     |             |              |

Type 7. Type of work within sale place structure

| Variables                  |                 | Count & % Within sale place structure |             |             | Total        |
|----------------------------|-----------------|---------------------------------------|-------------|-------------|--------------|
|                            |                 | Fixed                                 | Mobile      | Open tray   |              |
| Type of work               | tea             | 35(6.2%)                              | 148(33.3%)  | 295(51.7%)  | 478(30.2%)   |
|                            | tradition food  | 100(17.7%)                            | 61(13.7%)   | 72(12.6%)   | 233(14.7%)   |
|                            | juices & sweets | 202(35.7%)                            | 11(2.5%)    | 16(2.8%)    | 229(14.5%)   |
|                            | sandwiches      | 229(40.5%)                            | 0(0.0%)     | 5(0.9%)     | 234(14.8%)   |
|                            | snacks          | 0(0.0%)                               | 152(34.2%)  | 70(12.3%)   | 222(14.0%)   |
|                            | vegetables      | 0(0.0%)                               | 2(0.5%)     | 85(14.9%)   | 87(5.5%)     |
|                            | grilled         | 0(0.0%)                               | 70(15.8%)   | 28(4.9%)    | 98(6.2%)     |
| Total                      |                 | 566(100.0%)                           | 444(100.0%) | 571(100.0%) | 1581(100.0%) |
| Chi-square test sig < .000 |                 | (Approx. Sig 0.000)                   |             |             |              |

Table 8. Type of work within valid card

| Variables                  |                 | Count & % within valid card |             |             | Total        |
|----------------------------|-----------------|-----------------------------|-------------|-------------|--------------|
|                            |                 | Yes                         | No valid    | Not found   |              |
| Type of work               | Tea             | 108(20.7%)                  | 180(33.6%)  | 190(36.3%)  | 478(30.2%)   |
|                            | Tradition food  | 130(25.0%)                  | 61(11.4%)   | 42(8.0%)    | 233(14.7%)   |
|                            | Juices & sweets | 145(27.8%)                  | 73(13.6%)   | 11(2.1%)    | 229(14.5%)   |
|                            | Sandwiches      | 113(21.7%)                  | 107(20.0%)  | 14(2.7%)    | 234(14.8%)   |
|                            | Snacks          | 10(1.9%)                    | 36(6.7%)    | 176(33.6%)  | 222(14.0%)   |
|                            | Vegetables      | 8(1.5%)                     | 31(5.8%)    | 48(9.2%)    | 87(5.5%)     |
|                            | Grilled         | 7(1.3%)                     | 48(9.0%)    | 43(8.2%)    | 98(6.2%)     |
| Total                      |                 | 521(100.0%)                 | 536(100.0%) | 524(100.0%) | 1581(100.0%) |
| Chi-square test sig < .000 |                 | (Approx. Sig 0.000)         |             |             |              |

Table 9. Type of work within appropriate clothing

| Variables                  |                 | Count & % within appropriate clothing |             |             | Total        |          |
|----------------------------|-----------------|---------------------------------------|-------------|-------------|--------------|----------|
|                            |                 | good                                  | Moderate    | Poor e      |              |          |
| type of work               | Tea             | 85(12.7%)                             | 211(66.4%)  | 182(30.7%)  | 478(30.2%)   |          |
|                            | Tradition food  | 119(17.8%)                            | 54(17.0%)   | 60(10.1%)   | 233(14.7%)   |          |
|                            | Juices & sweets | 207(30.9%)                            | 3(0.9%)     | 19(3.2%)    | 229(14.5%)   |          |
| Variables                  | Sandwiches      | 234(34.9%)                            | 0(0.0%)     | 0(0.0%)     | 234(14.8%)   |          |
|                            | Snacks          | 18(2.7%)                              | 43(13.5%)   | 161(27.2%)  | 222(14.0%)   |          |
|                            | Vegetables      | 0(0.0%)                               | 0(0.0%)     | 87(14.7%)   | 87(5.5%)     |          |
| Training                   | Yes / No        | Grilled                               | 7(1.0%)     | 7(2.2%)     | 84(14.2%)    | 98(6.2%) |
| Total                      |                 | 670(100.0%)                           | 318(100.0%) | 593(100.0%) | 1581(100.0%) |          |
| chi-square test sig < .000 |                 | (Approx. Sig 0.000)                   |             |             |              |          |

Table 10. Place of work within valid health card

| Variables                             |                   | Count & % within valid health card |             |             | Total        |
|---------------------------------------|-------------------|------------------------------------|-------------|-------------|--------------|
|                                       |                   | Yes                                | No          | Not found   |              |
| place of work within valid Healthcard | Nile              | 100(19.2%)                         | 83(15.5%)   | 80(15.3%)   | 263(16.6%)   |
|                                       | Neighborhood      | 58(11.1%)                          | 62(11.6%)   | 64(12.2%)   | 184(11.6%)   |
|                                       | In markets        | 140(26.9%)                         | 105(19.6%)  | 155(29.9%)  | 400(25.3%)   |
|                                       | E institution     | 33(6.3%)                           | 70(13.1%)   | 55(10.5%)   | 158(10.0%)   |
|                                       | Hospitals         | 27(5.2%)                           | 41(7.6%)    | 52(9.9%)    | 120(7.6%)    |
|                                       | Trans--station    | 85(16.3%)                          | 118(22.0%)  | 50(9.5%)    | 253(16.0%)   |
|                                       | Recreational area | 35(6.7%)                           | 13(2.4%)    | 15(2.9%)    | 63(4.0%)     |
|                                       | others            | 43(8.3%)                           | 44(8.2%)    | 53(10.1%)   | 140(8.9%)    |
| Total                                 |                   | 521(100.0%)                        | 536(100.0%) | 524(100.0%) | 1581(100.0%) |
| chi-square test sig < .000            |                   | (Approx. Sig 0.000)                |             |             |              |

## DISCUSSION

The latest cross-sectional descriptive study on the sociodemographic features of street food vendors in Khartoum found that 55.6% of them were women. This could be the case because some occupations, including selling tea (30.2%) and traditional meals (14.7%), are more frequently linked to women. Additionally, this study revealed that street food is sold in markets the most (16.6%), followed by Nile Beach (16.3%). It was restricted to a range of regional specialties, including unsweetened confections, nibbles, and homemade ice cream (Al-Dandarmah), as well as fresh produce, sandwiches, and various locally manufactured juices. The study also revealed that many participants (36.5%) were between the ages of 27 and 37; however, some participants (2.6%) were younger than 18 years old, and 15% of participants had only received khalwa education, as the majority of street food workers were not trained. Regarding food safety This is clear from the responses given by employees regarding their knowledge and practices regarding food safety and food selling. The responses provided by street vendors in the questionnaire intended for this purpose bear this out: sixty-seven percent of food preparers and sellers do not wear hats, twenty-two percent do not wear acceptable work clothes, and seventy-five percent do not preserve food according to the recommended methods. Furthermore, only 1.9% of them said they wash dishes with tap water, and 46.9% said they use the same hand to handle money and food. More than thrice was frying oil used by a few of them. Only 28.5% of them said they cleaned with detergents, all of which increase the danger of consuming food. This is further supported by Table 5, which indicates that vendors' knowledge of food safety is generally somewhat trending in their responses, with a response rate of roughly 70.67%. 2.12 is the arithmetic mean, and 0.79 is the standard deviation. Since 67.7% of street vendors said they lacked sufficient space to wash utensils while selling food, this study also provided insight into the environmental conditions in which they operate. On the other hand, only 2.28% of the sample said that their workplace has a suitable bathroom, even though this is one of the most important elements in creating a healthy atmosphere in the sales place. The survey also reveals that the majority of street food is displayed in places made up of inappropriate materials (35.8%), including wood or straw, and open trays (36.1%), exposing the food to various pathogens. In addition, a large proportion of food vendors (53.8%) bring home-cooked meals, It permits them to stay for an extended amount of time before usage, as improper storage may expose them to other microorganisms. A few observations on questions that were not accurately answered were made during the survey.

This is comparable to the transitory kiosks, which made up 35.8% of the sales locations, particularly the ones that served traditional dishes like oatmeal and kasra. Sixty-one percent of them were constructed using rakoba, or worn-out materials like straw and wood. This permits contact with dust and insects. Additionally, it was noted that 45% of the food on the table was both cooked and raw, which increases the risk of microbial contamination. Furthermore, a considerable number of the tables are composed of plastic, and a portion of them are older, making thorough cleaning challenging (41%). Additionally, 37.9% of street vendors are situated in direct sunshine without an umbrella, exposes food to a variety of contamination factors, including enhanced microbial growth and the spread of microorganisms from the environment to food surfaces. Additionally, it was noted that fruits and vegetables for sale were scattered about without being elevated off the ground (29.2%). It was also observed that, in addition to not paying attention to attire appropriate for the type of job (56.1%), some food items, particularly snacks, are packaged directly by hand without the use of gloves (41.7%). which is in line with several other research that examined comparable working conditions, health, knowledge and habits, and demography. These results are similar to studies conducted in the 2009 in the northern Sudanese city of Atbara. (Abdalla et al., 2009) and another carried out in Nigeria in 2019 (Akinbule et al., 2019). According to the chi-square test, there is a statistically significant relationship between gender and type of work, as well as between the structure of the selling place and the type of food offered for sale, as well as between knowledge of food hygiene and those who have received training in this. As well as the place of work, type of food, presence and validity of the health card, as well as wearing appropriate clothing for work. Which was a chi-square test < .000 (about Sig 0.000)

## Conclusion

The study included different types of foods that were displayed and sold on the street in various parts of Khartoum State, such as traditional prepared foods such as kisra, salads, and sandwiches with various ingredients, and drinks such as tea, juices, snacks, beans, chickpeas, and others such as fresh vegetables, fruits, and others. It is noted that most of these materials come ready-made from home, and a few of them are prepared in the same place of sale, where they are sometimes handled for a period longer than five hours without a suitable place for storage, which sometimes leads to their contamination and, consequently, the spread of some diseases as a result. There is several children, 2.6%, who participate in street vending, and most of them do not have any information about food safety, in addition to other vendors. The study also

revealed many unhealthy practices in preparing and handling foods while handling them, not wearing appropriate clothing to perform work, and a lack of information about the health and safety of foods. And the diseases resulting from it, as 56.3 did not receive any kind of training on this, and there is clear negligence in not obtaining health cards or adhering to health work regulations, as only 34.7 of them have valid health cards.

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