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An Investigation of the Food Safety Knowledge of Street Food Vendors and Sanitary Conditions of Their Vending Sites

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Abstract The possession of low food safety knowledge, inadequate food preparation facilities and the lack of sanitary resources by street food vendors may result in inappropriate food hygiene practices and poor sanitary conditions at street food vending sites. This study aimed to investigate the general food safety knowledge of street food vendors in Marabastad, Pretoria, as well as the sanitary conditions of their street food vending sites. A cross-sectional research design was conducted in which data was collected from 250 street food vendors selected purposefully. The street food vendors were interviewed using a structured questionnaire and their street food vending sites were observed using a sanitary observation checklist. Most street food vendors were male (66.8%) and above the age of 36. The vast majority (70%) of street food vendors had not attended any food safety training course. The majority (76%) of street food vendors possessed inadequate food safety knowledge while 20% had moderate food safety knowledge and only 4% had high food safety knowledge. All the street food vending sites had a sanitary compliance score of 17 or lower out of 39. More than three-quarters of street food vendors in Marabastad had low food safety knowledge. All the street food vending facilities in Marabastad had low compliance with sanitary criteria and therefore the food sold here can constitute a health risk.

Keywords: *street food vendors, food safety, sanitary conditions, sanitary compliance*

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1. Introduction

Street food vending has proven to be of value in both developing and developed countries [1]. This sector is reputable for creating employment opportunities for individuals from underprivileged communities in developing countries while also contributing to the country's gross domestic product (GDP) [2]. However, unregulated sites often lack sanitary facilities, leading to inappropriate food handling and potential contamination [3]. Sanitary amenities like hand washing soap, functional toilets, and clean water are not available on street food vending sites [4]. Inadequate sanitation has proven to be an obstacle to the proper implementation of food safety procedures [5].

The lack of food safety knowledge by food handlers is a contributing factor to poor hygiene practices during food handling [1]. Up to 76.8% of street food vendors were found to lack adequate food safety knowledge in a study conducted in Johannesburg in 2021 and this can limit their food safety awareness [6]. In Marabastad, food hygiene regulations are often not monitored or enforced giving rise to increased and uncontrolled street food vending activities [7]. Mathikhi and Ramukumba (2020:395) found that the Marabastad open market lacks hygienic amenities such as water supply, waste disposal system and appropriate equipment resources such as storage facilities, refrigerators, electricity, and food reheating equipment which put food safety at risk [8]. Adequate food safety knowledge and food hygiene skills are crucial in the prevention of cross-contamination during food preparation [9].

Street food vendors with sufficient food safety knowledge will be aware of food safety measures and be able to implement food hygiene practices [10]. The risk of contamination of street-vended food with pathogens and spoilage bacteria would be minimal if street food vendors implemented food hygiene practices during food handling [11]. Food safety training is crucial for street food vendors to become more knowledgeable about food hygiene practices [12]. Street food vendors need to be trained on interventions like personal hygiene, food hygiene, food cooking and storage temperatures to raise their awareness of food safety practices [6]. The handling of food by street food vendors who have not undergone food safety training and possess inadequate food safety knowledge can constitute a food safety risk to consumers [13]. This study aims to investigate the general food safety knowledge of

street food vendors in Marabastad, Pretoria. Furthermore, to assess the sanitary conditions of the street food vending sites will be assessed.

2. Research Methodology

2.1. Study Population

This research project was conducted in the Marabastad open market (also called Asiatic Bazaar), located in Pretoria the capital city of South Africa. Pretoria is in the City of Tshwane Metropolitan Municipality. Street food vendors in Marabastad are located within the major streets in Marabastad. These streets are Bazaar Street taxi rank, Jerusalem taxi rank, Marabastad bus rank, 7th Street taxi rank, Belle Ombre taxi rank, and Belle Ombre train station. The commercial activities in Marabastad include Taxi businesses, auction businesses, car dealerships, wholesalers, street food vending, and hairdressers. The nature of taxi rank activities together with all other businesses in Marabastad favours street food vending activities. The study population was street food vendors in the demarcated areas in the Marabastad informal market such as the Bazaar Street taxi rank, Jerusalem taxi rank, Marabastad bus rank, 7th Street taxi rank, Belle Ombre taxi rank, and Belle Ombre train station.

2.2. Research Design and Sampling

This research project was conducted in the Marabastad open market (also called Asiatic Bazaar), located in Pretoria the capital city. Street food vendors were selected purposefully for data collection. Street food vendors who accepted to partake in the study were provided with an information sheet and after the purpose of the study was explained, they were required to give their consent to participate in the study by signing a consent form. The sample size was estimated using the Cochran formula N= (z2 p(1-p)/e2) at a 95% confidence level, and an error margin of 5%. A total of 250 street food vendors who agreed to participate in the study were interviewed for data collection and their food service facilities were observed. Permission to conduct this research study was obtained from the Tshwane Municipality offices in Pretoria (Appendix 04).

2.3. Data Collection

Data collection using an interview using a questionnaire and inspection using a checklist. Each interview session and observation session took 20 minutes to complete. The questionnaire consisted of different sections. The first section sought to get the demographic information of street food vendors (age, gender, marital status educational level). The second section focused on the characteristics of street food vending facilities. The third section focused on the food safety knowledge of street food vendors. The observation checklist was used to determine the sanitary compliance of street food vending sites with sanitary requirements.

A pilot study was conducted to ensure the questionnaire and checklist were valid and to determine the reliability of the questionnaire instruments by experienced researchers in food safety management. A total of 10 street food vendors were interviewed for this purpose and the sanitary condition of their street food vending sites was observed. The data collected from the pilot study was not used in the actual study. Reliability was ascertained at Cronbach's alpha value criterion between 0.6-0.7 [14].

Ethics clearance was obtained from the Tshwane University of Technology (TUT) research ethics committee.

2.4. Statistical Analysis

The data collected were statistically analysed using SPSS software version 23. A descriptive statistic was conducted to show the frequency distribution of the socio-demographics of respondents, characteristics of street food vending facilities, the compliance of street food vending sites to sanitary requirements, and the safety knowledge of street food vendors. The assessment of food safety knowledge was conducted as follows: Scores of 0-49% =low FSK, Scores of 50-74% = moderate FSK and Scores of 75-100% high FSK and the assessment of sanitary compliance scores out of 39 was conducted as follows:1-14=low compliance, Scores of 15-27 = Moderate compliance and Scores of 28-39 = High compliance. Statistical significance was identified at a 95% confidence level (p-value<0.05). The non-parametric analysis of variance ANOVA using the Kruskal-Wallis test was used to analyse differences in the food safety knowledge, and sanitary requirements between demographic factors.

3. Results and Discussion

3.1. Sociodemographics of Respondents

Table 1 shows the sociodemographics of respondents. The majority, (66.8%) of the respondents were males, compared to 33.2% were female., since street food vending is risky due to high crime rates in Marabastad, and it is a strenuous activity [15]. Furthermore, street food vending is labour-intensive and involves the carrying of heavy-duty cooking equipment [16]. A similar finding was made by Addo-Tham et al. (2020), in a study conducted in Ejisu-Juaben, Ghana, in which male street food vendors outnumbered their female counterparts [17].

Furthermore, a study conducted in Vhembe, District, South Africa, revealed a contrary finding in rural South Africa, in which female street food vendors were found to outnumber their male counterparts [18]. The reason provided was females dominate rural areas in terms of population where crime levels are relatively low compared to urban areas.

However, in urban areas in South Africa such as Durban, Cape Town, and Johannesburg where street food vending has been formalised by the municipalities through the provision of food vending stalls and security, female street food vendors may outnumber their male counterparts [20]. The reason could be that female street food vendors are more like to thrive where there is adequate security [21].

Table 1. Socio-demographic of respondents

Socio-demographic characteristics		**Frequency** N (%)
1 Gender	Male	167 (66.8)
	Female	83 (33.2)
	Other	0 (0)
2 Age:	18-25	19 (7.6)
	26-35	97 (38.8)
	36-45	100 (40.0)
	46-55	33 (13.2)
	56-65	1 (0.4)
3 Marital Status	Never married	178 (71.2)
	Married	51 (20.4)
	Living with a partner	20 (8.0)
	Widowed	1 (0.40)
	Divorced/Separated	0 (0)
4 Level of education	No formal education	53 (21.2)
	Primary school (grades 1-7)	25 (10.0)
	High school (grade 8-12)	170 (68.0)
	Tertiary education	2 (0.8)
5 Duration of street food vending at the current site	Less than 2 months	14 (5.6)
	2–6 months	83 (33.2)
	7–9 months	151 (60.4)
	More than 9 months	2 (0.8)
6 Attendance of food safety training course	Yes	75 (30.0)
	No	175 (70.0)
7 Average monthly income from street food vending	Less than R500	145 (58.0)
	R501-1000	65 (26.0)
	R1,001-5,000	40 (16.0)
	Above R5,000	0 (0)
8 Is street food vending the main source of income?	Yes	243 (97.2)
	No	7 (2.8)

The majority (53.6%) of respondents were 36 years above, most of whom (40%) were between 36-45 years. This is a result of the high unemployment rate considering most street food vendors are economically active youth who are jobless and rely on street food vending for a living [22]. This finding is similar to a study conducted in Johannesburg, South Africa, which discovered that the majority (35.6%) of street food vendors were above the age of 36 [6]. The reason provided in that study was that these age groups are the most energised and active working youthful population in any society [4].

The majority, (71.2%) of the respondents were not married.. This can be attributed to South Africa's declining marriage rate [23]. Furthermore, Mohlabane, Gumede, and Mokomane (2019:156), attribute the reduction in marriage in South Africa partly to economic causes such as rising living costs, poverty, and unemployment [24]. This conclusion was supported by research done in Cape Town province, by Hill et al. (2019:407), who discovered that the majority (45%) of street food vendors were not married, and the reason provided was that street food vendors work long hours daily [25].

The majority, (68%) of the respondents have obtained high school Matric certificates, 21.2% had no formal education, 10% had reached primary school, and (0.8 %) obtained tertiary education. This can be attributed to South Africa's legislation on free and compulsory education from Grades 1 to 9 [26]. According to the Department of Basic Education in South Africa, the vast majority (98%) of children between 7 to 17 years in South Africa attend a school or an educational facility [27]. The lower level of Higher Education attendance can be attributed to the fact that, most street food vendors in South Africa hail from historically economically disadvantaged communities due to Apartheid that can only afford high school and cannot afford higher education [28]. This is because most street food vendors are from poor families and cannot afford to pay the high cost of Higher Education in South Africa [27].

The majority, (60.4%) of the respondents had been selling street vended food on the current vending site for 7-9 months, 33.2% for 2-6 months. This might be related to the temporary nature of street food vending many street food vending sites lack the necessary permits and resources to operate permanently [29]. The majority, (70%) of the respondents had not attended a food safety training course, while only 30% had attended a food safety training course. This is because food safety training programs with relevance to street food vending are not available and most of them cannot afford the cost of attending training programs destined for the commercial food service sector [4].

The majority (84%) of respondents indicated they earned a monthly average income of less than R500 while having street food vending as their main source of income. This can be because street food vending is a highly competitive and income-generating food service business [15]. This is evident from a study by Bhoola and Chetty (2022:5), conducted in Durban, South Africa, which states that street food vendors earn less than R500 profits due to high competition in street food vending locations [16]. The majority of respondents rely on street food vending as their primary source of income, because of South Africa's high youth unemployment rate and street food vending provides an opportunity for self-employment and income generation [18].

3.2. Characteristics of Street Food Vending Sites

Table 2 shows the characteristics of street food vending sites. The majority, (98.8%) of the respondents carry out street food vending shelters, while 1.2% of street food vendors had no shelters. These shelters often lack the necessary sanitary resources that are essential for food hygiene practices [30]. This finding is similar to that of Sepadi and Nkosi (2022:4), who found that the majority (79%) of street food vendors in Johannesburg, South Africa, used make-shift shelters for food preparation [20]. The majority, (98.8) of respondents indicated that their customers eat onsite, while 1.2% indicated their customers eat offsite. It is convenient for customers to eat at street food vending locations [31]. This is consistent with the findings of research conducted in Vhembe District, Limpopo, by Mahopo et al. (2022:4), which stated that the vast majority (98%) of street food vendors provided eating on-site hence the need to enforce food safety regulations for street food vending[18].

Table 2. Characteristics of street food vending facilities

Profile Characteristics		**Frequency** N (%)
Street food vending facility is in a shelter (facility/premises)?	Yes	247(98.8)
	No	3 (1.2)
Do you prepare your street-vended food at your vending facility?	Yes	250(100.0)
	No	0(0)
Do customers eat onsite in your street food-vending facility?	Yes	247(98.8)
	No	3(1.2)

3.3. An Evaluation of the Food Safety Knowledge of Street Food Vendors

Based on the overall assessment, the vast majority (76%) of street food vendors had low food safety knowledge, while few street food vendors had moderate food safety knowledge (20%), and high food safety knowledge (4%), respectively (Figure 1). Table 3 shows how street food vendors responded to food safety knowledge questions. Only two knowledge questions were answered correctly by 50% or more respondents. This can be attributed to the lack of food safety training opportunities for street food vendors [19]. In a study conducted by Nkosi and Tabit (2021:5), the majority (76%) of street food vendors in Zululand Districts, South Africa, were found to possess low food safety knowledge and the reason provided was due to a lack of food safety training on food safety[4]. Low food safety knowledge can hamper the implementation of food safety measures during food services [32]. Adequate food safety knowledge is necessary for maintaining good personal hygiene and preventing cross-contamination [33]. Street food vendors with adequate food safety knowledge can lower the risk of food contamination during food services [10].

Regarding the food safety themes, the lowest percentage of correct responses was observed for the food hygiene theme with only 8% correct responses. This was followed by the cooking and holding temperature theme with only 18.5% correct responses, the personal hygiene theme with 31.9% correct responses and an overall correct response of 34.7% (Figure 2). These findings do not come as a surprise since various aspects of food hygiene, cooking and holding temperature and personal hygiene can only be understood after structured training hence the low level of knowledge possessed by street food vendors [34]. In a study conducted at the University of Limpopo Turfloop Campus, South Africa, the majority (85%) of street food vendors were found not to clean their dishcloths regularly due to the lack of food safety awareness [35]. Adequate knowledge of food hygiene, cooking and holding temperature, and personal hygiene is essential in avoiding cross-contamination as well as the propagation and growth of food-borne pathogens in street-vended foods [4]. Cases of foodborne disease outbreaks are common in South Africa but are often underreported [36]. The occurrence of foodborne disease outbreaks can be exacerbated by the lack of adequate knowledge on food hygiene, cooking and holding temperature and personal hygiene among street food vendors [37].

Table 3. The food safety knowledge of street food vendors (N =250)

Knowledge Questions	**Correct response** n(%)
PART 1. PERSONAL HYGIENE KNOWLEDGE	
1 Which of the following is the correct way to wash your hands during the preparation and serving of food?	70 (28.0)
1.1 Wash hands with warm running water and wipe dry with a clean cloth	
1.2 Wash hands with cold running water and wipe dry with a clean cloth	
1.3 Wash hands with soap and cold running water and then wipe dry with a clean cloth	
1.4 Wash hands with soap and warm running water and then wipe dry with a clean cloth	
1.5 Both 3 and 4 above are correct	
2 As a food handler, which of the following compels you to wash your hands when you are involved in the preparation and serving of food?	20 (8.0)
2.1 After visiting the toilet only	
2.2 After picking your nose	
2.3 None of the above	
2.4 All the above	
3.1 As a food handler, I must not handle food when I have diarrhoea, even if I wash my hands regularly.	205 (82.0)
3.1aTrue	
3.1b False	
3.2 As a food handler, I must not handle food, bank notes and coins interchangeably when I have flu, common cold, cough, or catarrh.	79 (31.6)
3.2a True	
3.2b False	
4 As a food handler, which of the following is the correct way to dry your hands after you have washed them properly?	33 (13.2)
4.1 Wipe using an apron	
4.2 Wipe using a clean and dry cloth or serviette	
4.3 Wipe using a clean and dry dishcloth	
4.4 All the above	
4.5 None of the above	
5 As a food handler, which of the following is the correct thing to do if you have a wound on your hands?	2 (0.8)
5.1 Cover the wound with a bandage	
5.2 Wear gloves to cover the wound	
5.3 Do nothing if it is not painful	

5.4 Wash the wound and apply waterproof dressings before wearing gloves	
5.5 None of the above	
PART 2. FOOD HYGIENE KNOWLEDGE	
6 Which of the following best describes a correct display container where prepared foods should be stored before selling?	50 (20.0)
6.1 In a clean display container free from dust	
6.2 In a clean and rust–free display container	
6.3 In a clean display container in direct contact with the floor	
6.4 All of the above	
6.5 Only 1 and 2 are correct	
7 Which of the following is the correct thing to do if protein-rich foods made from milk, meat and fish are exposed to non-refrigeration temperatures (below 5 ºC) for more than 2 hours?	9 (3.6)
7.1 Quickly put perishable food back into the refrigerator	
7.2 Discard perishable food	
7.3 Quickly cook the perishable food	
7.4 Both 1 and 2 are correct	
7.5 All of them are correct	
8 Which of the following is the safest way to thaw perishable foods such as meat, fish, dairy, and poultry products?	4 (1.6)
8.1 Allow perishable foods to thaw on a table	
8.2 Allow perishable foods to thaw in hot water	
8.3 Allow thawing on the lower shelve of the refrigerator	
8.4 Both 2 and 3 are correct	
8.5 None of the above is safe	
9 Which of the following is the safest way to use cutting boards to avoid cross-contamination between them?	49(19.6)
9.1 Use separate cutting boards for meat and salad but wash them in between usage.	
9.2 Use any cutting boards for meat and salad but wash them in between usage	
9.3 Use the same cutting board for meat and salad but wash them in between usage	
9.4 All of the above ways are correct	
PART 3 KNOWLEDGE OF COOKING AND HOLDING TEMPERATURES OF FOODS	
10 Which of the following is the correct minimum internal cooking temperature for poultry?	45 (18.0)
10.1 190°C	
10.2 65 °C	
10.3 100 °C	
10.4 78 °C	
11 Which of the following is the correct temperature guideline for the cold holding of ready-to-eat foods such as salad during serving?	136 (54.4)
11.1 At about 25 °C.	
11.2 At about 10 °C	
11.3 At about 5 °C	
12 Which of the following is the correct temperature for the hot holding of ready-to-eat foods such as beef and chicken stew during serving?	96 (38.4)
12.1 At about 100 °C	
12.2 At about 63 °C	
12.3 At about 25 °C	

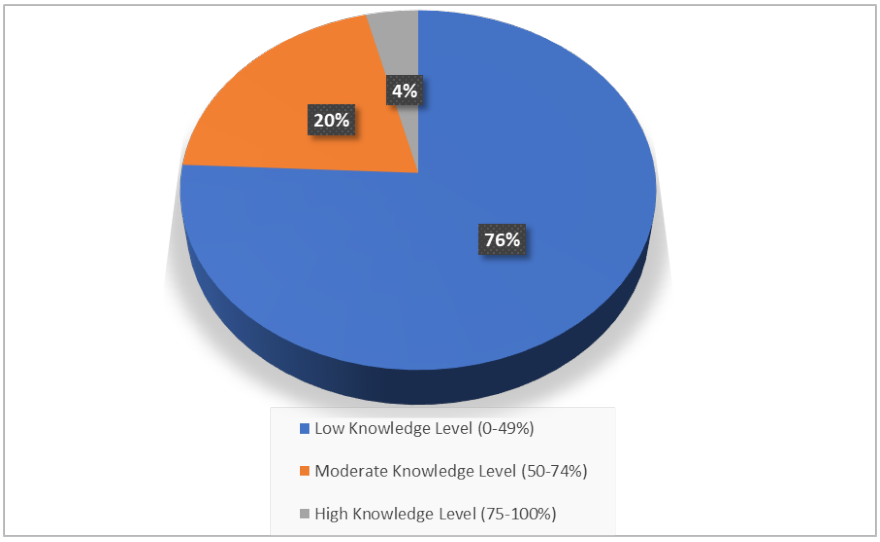

Figure 1. Overall assessment of food safety knowledge of street vendors (N=250)

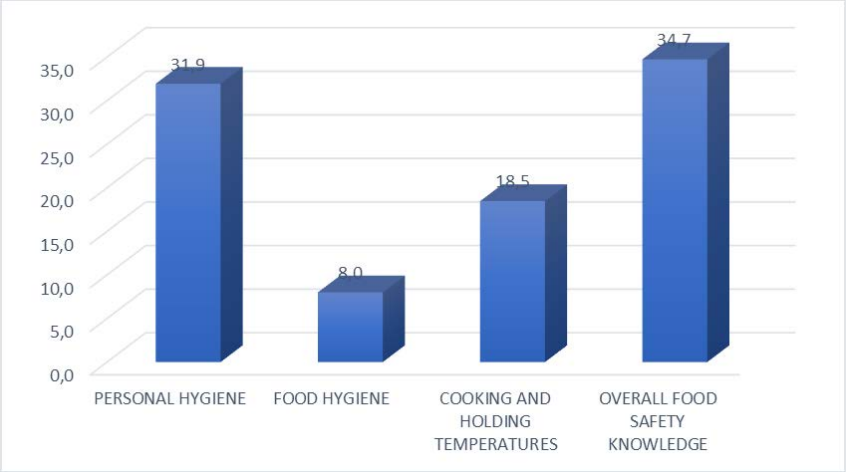

Figure 2. Percentage of correct responses provided by respondents to food safety knowledge questions per theme and overall (N= 250)

3.4. Compliance of Street Food Vending Sites With Sanitary Conditions

In terms of compliance, the overall compliance with sanitary requirements was 29% and in terms of the sanitary requirements themes, none of the themes had up to 50% of vending sites in compliance with them (Figure 3). The highest sanitary compliance score observed was 17 out of 39 sanitary criteria and the scores ranged from 8 to 17 (Figure 4). Furthermore, only 4 sanitary criteria had more than 50% compliance by the street food vending facilities (Table 4). The reasons for the high levels of non-compliance with sanitary requirements can be attributed to the non-compliant nature of many street food vending facilities in terms of the regulations governing general hygiene requirements in South Africa [38]. Street food vendors in Marabastad had low sanitary compliance because street food vending sites do not have access to infrastructure such as portable water, electricity, and effective garbage disposal systems [39]. This finding is similar to that of a study done in Johannesburg, South Africa by Oladipo-Adekeye and Tabit (2021:5), in which 54% of street food vendors had no waste disposal bin with lid and up to 33% of street food vendors lacked a portable water supply on their vending sites [6]. Unsanitary hygiene conditions at street food vending sites are aggravated by the lack of sanitary facilities, which makes it difficult for street food vendors to implement effective food hygiene practices [40]. Street food vending sites must be equipped with essential storage resources and sanitation resources since a high level of sanitation compliance needs proper infrastructure resources to ensure that street food vendors comply with food safety and hygiene [41].

Furthermore, the low compliance with sanitary requirements can also be attributed to the lack of monitoring and enforcement of hygiene regulations by authorities [42]. This is similar to the findings of a study by Oladipo-Adikeye and Tabit (2021:4) conducted in Johannesburg, where 31.7% of street food vending facilities were not monitored by authorities[6]. Most developing countries, including South Africa, India, and Ghana, have been found to have poor monitoring and enforcement of existing hygiene regulations [43]. In addition to monitoring and enforcement, municipal authorities should provide sanitary resources in the form of street food vending infrastructure that facilitates food hygiene practices [44]. A study conducted in Johannesburg, South Africa, found that 27% of street food vendors did not have access to portable water in their food vending stalls [20]. The lack of potable water will make it almost impossible to ensure sanitation at street food vending sites [45]. Furthermore, street food vendors often change vending locations, which makes it difficult for health inspectors to examine street food vending activities [46]. Frequent inspection and monitoring of street food vending locations by health inspectors from the municipality can ensure that street food vendors follow general hygiene requirements [47].

3.5. Analysis of Variance of the Food Safety Knowledge and Sanitary Compliance

Findings of the analysis of variance of the food safety knowledge of respondents and compliance with their street food vending sites were presented in Table 5. The ANOVA results indicated that the food safety knowledge Mean Rank Scores of the different sociodemographic categories under gender, age, marital status, level of education, duration of street food vending at current sites, food safety training course attendance and average monthly income were significantly different ($P \leq 0.05$). However, no definite patterns were observed across the categories as increasing age, level of education and average income did not lead to an increase in the food safety knowledge mean rank score. Within the marital status sociodemographic variable, no significant difference ($P > 0.05$) was observed in the food safety knowledge mean rank scores. The reason for these findings is that the level of food safety knowledge is influenced by the provision of training which was not the case with the street food vendors in Marabastad [48]. The compliance of street food vending sites with sanitary requirements did not differ significantly ($P > 0.05$) within the categories of the socio-demographic variables. This is because most of the street food vending facilities occupied by street food vendors are for the most part noncompliant with food hygiene regulations [4].

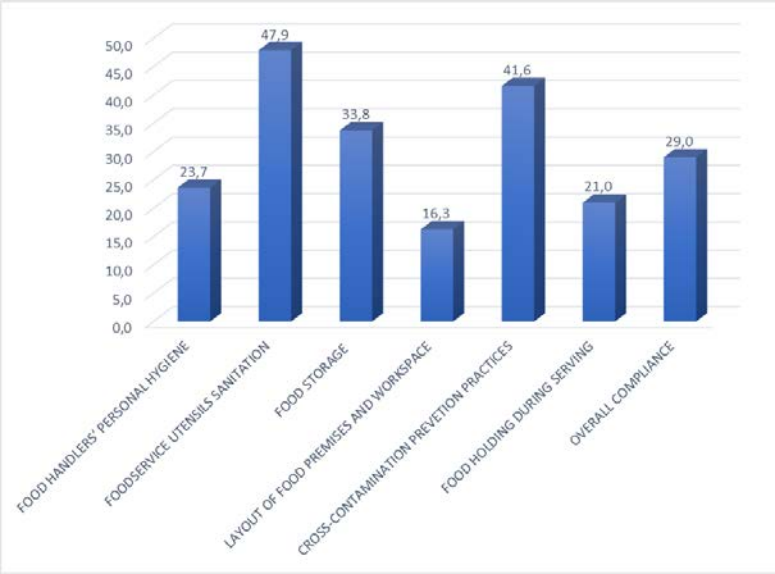

Figure 3. The percentage compliance of street food vending sites with sanitary requirements

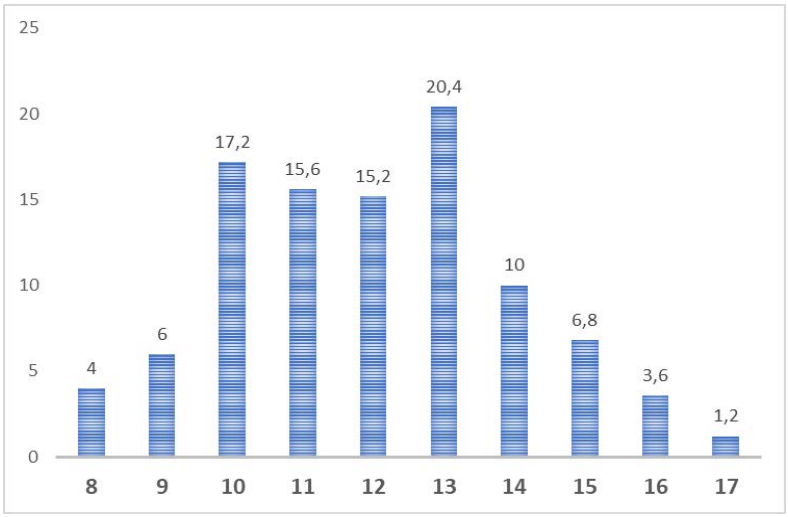

Figure 4. Percentage distribution of the various sanitary compliance scores of street food vending sites

Table 4. The compliance of street food vending sites to sanitary requirements

	Sanitary requirements	Compliance n (%)
1.	FOOD HANDLERS' PERSONAL HYGIENE	
1.1	Are Personnel wearing neat protective clothing dedicated to food service?	0 (0)
1.2	Do food handlers wash their hands in clean water each time before handling food?	0 (0)
1.3	Do food handlers use an apron when preparing food?	54 (21.6)
1.4	Do food handlers handle money while serving food?	51 (20.4)
1.5	Are food handlers' hair covered when preparing food?	0 (0)
1.6	Are food handlers' fingernails clean?	250 (100)
2.	FOODSERVICE UTENSILS SANITATION	
2.1	Are utensils that are used to prepare food clean?	166 (66.4)
2.2	Are utensils adequately washed every time after use?	124 (49.6)
2.3	Are utensils stored in a dust-free container until used?	36 (14.4)
2.4	Do food handlers use the same utensils to prepare food?	76 (30.4)
2.5	Do food-holding containers have proper lids to protect food from dust?	197 (78.8)
3.	FOOD STORAGE	
3.1	Are displayed foods in direct contact with the ground surface?	70 (28.0)
3.2	Are displayed food storage containers free of dust?	184 (73.6)
3.3	Are food storage containers damaged?	168 (67.2)
3.4	Is there any cooling storage equipment at the vending site?	0 (0)
3.5	Is there any ready-to-eat hot food-holding equipment at the vending site?	0 (0)

4.	FOOD PREMISES AND WORKSPACE	
4.1	Are vending sites free of insects?	0 (0)
4.2	Is there a proper wastewater removal mechanism on the vending site?	0 (0)
4.3	Are there dedicated garbage disposal bins with lids at the vending site	0 (0)
4.4	Are there any toilet facilities that are available around vending sites?	15 (6.0)
4.5	Are there any hand-washing basins that are available at vending sites?	94 (37.6)
4.6	Is there sufficient space for hygienic storage of food?	82 (32.8)
4.7	Is the food preparation site effectively cross-ventilated?	18 (7.2)
4.8	Is there sufficient lighting for all food handling areas?	103 (41.2)
4.9	Is there appropriate food storage equipment?	95 (38.0)
4.10	Is there a tap water supply in the vending sites?	3 (1.2)
5.	CROSS-CONTAMINATION PREVENTION PRACTICES	
5.1	Do street food vendors use separate equipment to store raw food?	64 (25.6)
5.2	Do street food vendors use tasting spoons once?	113 (45.2)
5.3	Do street food vendors handle cutleries in a sanitary manner?	3 (1.2)
5.4	Is there any designated area for consuming food?	134 (53.6)
5.5	Do street food vendors use tobacco in any form while handling food?	217 (86.8)
5.6	Do street food vendors wear plastic disposable gloves when food is being handled by hand?	75 (30.0)
5.7	Do street food vendors serve food in a sanitary manner?	122 (48.8)
6.	FOOD HOLDING DURING SERVING	
6.1	Are food items packed in airtight containers?	36 (14.4)
6.2	Do street food vendors serve chilled food at the correct chilling temperature?	49 (19.6)
6.3	Do street food vendors serve food requiring hot storage at the correct temperature?	112 (44.8)
6.4	Is there visible moisture in the food container lids?	43 (17.2)
6.5	Do street food vendors have food display warmers to keep food warm?	75 (30.0)
6.6	Do street food vendors use one serving spoon per dish when serving food?	0 (0)

Table 5. The analysis of variance of the food safety knowledge of respondents and compliance of their street food vending sites

Demographic Characteristics		FSK Mean Rank Score	Kruskal-Wallis H	SC Mean Rank score	Kruskal-Wallis H
1 Gender	Male	131.15	0.073	127.76	0.479
	Female	114.14		120.96	
	Other	0		0	
2 Age:	18-25	103.29	<0.001	158.61	0.063
	26-35	82.42		126.41	
	36-45	182.75		126.50	
	46-55	87.74		99.36	
	56-65	247.00		171.00	
3 Marital Status	Never married	136.12	<0.001	127.76	0.148
	Married	117.10		130.04	
	Living with a partner	55.60		99.18	
	Widowed	61.00		18.00	
	Divorced/Separated				
4 Level of education	No formal education	141.68	0.036	127.35	0.564
	Primary school (grades 1-7)	93.58		106.78	
	High school (grade 8-12)	124.69		127.87	
	Tertiary education	165.00		109.00	
5 Duration of street food vending at the current site	Less than 2 months	0	0.002	0	0.576
	2–6 months	146.14		130.04	
	7–9 months	144.18		117.87	
	More than 9 months	111.68		127.63	
6 Attendance of food safety training course	Yes	119.57	0.385	111.69	0.056
	No	128.04		131.42	
7 Average monthly income from street food vending	Less than R500	128.69	<0.001	132.23	0.215
	R501-1000	146.46		115.53	
	R1,001-5,000	79.88		117.29	
	Above R5,000	0		0	
8 Street food vending is the main source of income	Yes	124.76	0.327	126.09	0.445
	No	151.29		105.14	

NB: FSK=Food Safety Knowledge and SC=Sanitary Compliance

4. Conclusion and Recommendations

This research investigated the food safety knowledge of street food vendors and the sanitary conditions of their vending sites, in Marabastad, Pretoria. Up to two-thirds of the street food vendors were female most of whom have attended high school, Street vending is the main source of income for the vast of street food vendors but only a third have attended a food safety training course. More than three-quarters of street food vendors in Marabastad had low food safety knowledge and there is no statistically significant difference between the food safety knowledge of male and female street food vendors. All the street food vending facilities in Marabastad had low compliance with sanitary requirements.

It is recommended that street food vendors should be trained in food safety and hygiene practices by the relevant municipal authorities. Furthermore, street food vendors should be provided with dedicated food service stalls with adequate resources and sanitation to ensure compliance with sanitary requirements. Relevant government authorities should continuously monitor and enforce sanitary requirements.

References

[1] V. Chakunda. A "War Against Livelihoods": Contestations Over the Government of Zimbabwe's Response to Street Vending in Selected Cities. City, Culture and Society vol. 34, Article number 100536.

[2] T. Morse, E. Tilley, K. Chidziwisano, R. Malolo, and J. Musaya. "Health Outcomes of an Integrated Behaviour-Centred Water, Sanitation, Hygiene, and Food Safety Intervention-A Randomised Before and After Trial," International Journal of Environmental Research and Public Health, vol. 17(8), pp. 1-19, 2020.

[3] E.M. Salvador, Z.A. Cossa, and T.L.J. Magaia. "Hygienic and Sanitary Conditions of Meals Sold in Vehicles on the Street of Downtown Maputo," Brazilian Journal of Food Technology, vol. 23(10), pp.1-10, 2020.

[4] N.V. Nkosi, and F.T. Tabit. The Food Safety Knowledge of Street Food Vendors and the Sanitary Conditions of Their Street Food Vending Environment in the Zululand District, South Africa. Heliyon, vol. 7, Article number e07640.

[5] P. Letuka, J. Nkhebenyane, and O.Thekisoe. "Street Food Handlers' Food Safety Knowledge, Attitudes and Self-Reported Practices and Consumers' Perceptions About Street Food Vending in Masure, Lesotho," British Food Journal, vol. 123(12), pp. 302-316.

[6] O.T. Oladipo-Adekeye, and F.T. Tabit. The Food Safety Knowledge of Street Food Vendors and the Sanitary Compliance of Their Vending Facilities, Johannesburg, South Africa," Journal of Food Safety, vol. 7(7), pp. 1-14, 2021.

[7] I. Ghatak, S. Chatterjee. Urban Street Vending Practices: An Investigation of Ethnic Food Safety Knowledge, Attitudes, and Risks Among Untrained Chinese Vendors in Chinatown, Kolkata. Journal of Ethnic Foods, vol. 5(4), pp. 272-285, 2018.

[8] M.S. Mathikhi, and T.S. Ramukumba. "Taxi Drivers' Perceptions of Occupational Health Risks Related to Their Work Environment in the City of Tshwane, South Africa," African Journal for Physical Activity and Health Sciences, vol. 26(4), pp. 393-409, 2020.

[9] D.P. Sudhagar, and G. Rajendran. "Selection Criteria of Customers of Chinese Restaurants and Their Dining Habits," International Journal knowledge management in Tourism and Hospitality, vol. 1(1), pp. 57-75, 2017.

[10] N. Allison, K. Ray, and J. Rohel. "The Role of Food Vendors in Urban Life, Food Culture and Society," Food Control, vol. 24(1), pp. 2-15, 2021.

[11] A.M. Girmay, S.R. Gari, B.M. Alemu, M.R. Evans, and A.G. Gebremariam. "Determinants of Sanitation and Hygiene Status Among Food Establishments in Adis Ababa," Ethiopia. Environmental Health Insights, vol. 14(1), pp. 1-9, 2020.

[12] I.Young, L.A. Waddell, B.J. Wilhelm, and J. Greig. "A systematic Review and Meta-Regression of Single Group, Pre-Post Studies Evaluating Food Safety Education and Training Interventions for Food Handlers," Food Research International, vol. 128(1), pp. 1-8, 2020.

[13] L.M. Zanin, D.T. Da-Cunha, V.V. De-Rosso, V.D. Capriles, and E. Stedefeldt. "Knowledge, Attitudes, and Practices of Food Handlers in Food Safety," Food Research International, vol. 100(1), pp. 53-62, 2017.

[14] L. Trinchera, N. Marie, and G.A. Marcoulides. "A Distribution-Free Interval Estimates for Coeffect Alpha," Structural Equation Modelling: A Multidisciplinary Journal, vol. 25(6), pp. 876-887, 2018.

[15] J. Mwove, S. Imathiu, I. Orina, and P. Karanja. "Food Safety Knowledge and Practices of Street Food Vendors in Selected Locations Within Kiambu County," Kenya," African Journal of Food Science, vol. 14(6), pp. 174-185.

[16] S. Bhoola, and D. Chetty. "Experiences and Perceptions of Economically Marginalized Women Food Vendors: An Exploratory Study of Informal Food Traders in Durban, South Africa," Journal of Social Inclusion, vol. 13(1), pp. 1-17, 2022.

[17] R. Addo-Tham, E. Appiah-Brempong, H. Vampere, E. Acquah-Gyan, and A.G. Akwasi. "Knowledge on Food Safety and Food-Handling Practices of Street Food Vendors in Ejisu-Juaben Municipality of Ghana," Hidawi, vol. 2020 | Article ID 4579573, 2020.

[18] T.C. Mahopo, C.N. Nesamvuni, A.E. Nesamvuni, and M. De Bryun. Socioeconomic Characteristic of Street Food Vending Enterprises in the Vhembe District, Limpopo Province," Technium Social Sciences Journal, vol. 29(1), pp. 419-430, 2022.

[19] P. Letuka, J. Nkhebenyane, and O. Thekisoe. Street Food Handlers' Food Safety Knowledge, Attitudes and Self-Reported Practices and Consumers' Perceptions About Street Food Vending in Maseru, Lesotho," British Food Journal, vol. 123 (13), pp. 302-316.

[20] L. Ma, H. Chen, H. Yan, L. Wu, and W. Zhang. Food Safety Knowledge, Attitudes, and Behaviour of Street Food Vendors and Consumers in Handan, A Third-Tier City in China. BMC Public Health, vol. 19, Article number: 1128, 2019.

[21] A.W. Drescher, C. Isendahl, M.C. Cruz, H. Karg, and A. Menakanit. "Urban and Peri-urban Agriculture in the Global South," Urban Ecology in the Global South, vol. 1(1), pp. 293-324, 2021.

[22] B.J. Birgen, L.G. Njue, D.M. Kaindi, F.O. Ogutu, and J.O. Owade. Determinates of Microbial Contamination of Street Vended Chicken Products Sold in Nairobi Country, Kenya. International Journal of Food Science, vol. 1(1), pp. 1-8, 2020.

[23] Y. KrieL, C. Milford, J. Cordero, F. Suleman, M. Beksinska, P. Steyn, & J.A. Smit. Male Partner Influence on Family Planning and Contraceptive Use: Perspectives from Community Members and Healthcare Providers in KwaZulu-Natal, South Africa," Reproductive Health, vol 16(1), pp. 1-15, 2019.

[24] N. Mohlabane, N. Gumede, and Z. Mokomane. "Attitudes Towards Marriage in Post-Apartheid South Africa," Journal of Comparative Family Studies, 1(2):156-188, 2019.

[25] J. Hill, Z. Mchiza, T. Puoane, and N.P. Steyn. "Food Sold by Street Food Vendors in Cape Town and Surrounding Areas: a Focus on Food and Nutrition Knowledge as Well as Practices Related to Food Preparation of Street Food Vendors," Journal of Hunger and Environmental Nutrition, vol. 15(30), pp. 401-415, 2019.

[26] P. Aunio, J. Korhonen, L. Ragpot, M. Tormanen, R. Mononen, and E. Henning. "Multi-Factorial Approach to Early Numeracy-The Effects of Cognitive Skills, Language Factors and Kindergarten Attendance on Numeracy Performance of South African First Graders," International Journal of Educational Research, vol. 97(1), pp. 65-76, 2019.

[27] M. Ashley-Cooper, L.J. Van Niekerk, and Atmore, E. "Early Childhood Development in South Africa: Inequality and Opportunity," South African Schooling: The Enigma of Inequality. Policy Implications of Research in Education, vol. 10, pp 87–108, 2019.

[28] A.A. Reddy, S. Ricart, and T. Cadman. "Driving Actors of Food Safety Standards in India: Learning from Street Food Vendors' Behaviour and Attitude. Food Security," vol. 12(6), pp. 1201-1217, 2020.

[29] J. Jeong, H. Kim, and K. Seo. "Quantitative Risk Assessment Model for Salmonellosis in Chicken Skewers From Street Food Vendors in South Korea," Journal of Food Protection, 82(6):955-962, 2019.

[30] L. Warlina, M. Yusuf, S.S. Ramadhani, and G.I. Ohoitimur. Planning Relocation Area of Street Food Vendor in Bandung City," International Journal of Design, 1(1):37-42, 2021.

[31] K. Abrahale, S. Sousa, G. Albuquerque, P. Padrao, and N. Lunet. "Street Food Research Worldwide: A Scoping Review. Journal Human Nutrition and Dietetics, vol. 32(1), pp. 152-174, 2019.

[32] T. Abdullah, N. Carr, and C. Lee. The Empowerment of Street Food Vendors, A Marginalised Community within the Hospitality Industry," Tourism Recreation Research, vol. 1(1), pp.1-14, 2022.

[33] J.K. HASSAN, and L.W. FWEJA. "Assessment of Food Safety Knowledge and Compliance to Hygienic Practices Among Street Food Vendors in Zanzibar Urban District," Current Journal of Applied Science and Technology, vol. 39(7), pp. 59-72, 2020.

[34] F.A. Nizame, M.U. Alam, A.A Masud, A.K. Shoab, A. Opel, M.L. Islam, et al. "Hygiene in Restaurants Among Street Food Vendors in Bangladesh," The American Journal of Tropical Medicine and Hygiene, vol. 101(3), pp. 566-576, 2019.

[35] D.M.R. Tleane. "Food Safety and Hygiene Practices of Street Food Vendors at Gate Two Vending Site at the University of Limpopo, Turfloop Campus, South Africa. Food Control, 1(3):30-45, 2020.

[36] G. Ntshoe, A.M. Shonhiwa, N. Govender, and N. Page. "A Systematic Review on Mobile Health Applications for Foodborne Disease Outbreak Management," BMC Public Health, vol. 21: Article number: 2228, 2021.

[37] M. Abughoush, A. Asghar, F.F.D. Dongmo, D. Macer, and A. Aberoumand. "Food Safety Knowledge, Attitudes, and Practices Among Consumers in Developing Countries: An International Survey," Food Research International, vol. 116(1), pp. 1386-1390, 2019.

[38] S.I. Ukenna, and A.A. Ayodele. "Applying the Extended Theory of Planned Behaviour to Predict Sustainable Street Food Patronage in a Developing Economy," Journal of Food Products Marketing, vol. 25(4), pp. 404-434, 2019.

[39] D. Mbendana, K. Mamabolo, M. Truter, Q. Kritzinger and A.R. NdhlalA. "Practices at Herbal (muthi) Markets in Gauteng, South Africa, and their Impacts on the Health of the Consumers: A Case Study of KwaMai-Mai and Marabastad muthi markets. South African Journal of Botany, vol. 126(1), pp. 30-39, 2019.

[40] C.I. Kothe, C.H. Schild, E.C. Tondo, P.D. Malheiros. "Microbiological Contamination and Evaluation of Sanitary Conditions of Hot Dog Street Vendors in Southern Brazil. Food Control, vol. 62, pp. 346–350, 2016.

[41] B. Huynh-Van, V. Vuong-Thao, T. Huynh-Thi-Thanh, S. Ang-Xuan, T. Huynh-Van, L. Tran-To et al. "Factors Associated with Food Safety Compliance Among Street Food Vendors in Can Tho City, Vietnam: Implications For Interventions Activity Design and Implementation," BMC Public Health, vol. 22, Article number: 94, 2022.

[42] C. Yapp, and R. Fairman. "Factors affecting food safety compliance within small and medium-sized enterprises: implications for regulatory and enforcement strategies," Food Control, vol. 17(1), pp. 42-51, 2006.

[43] J.M. Soon. "Rapid Food Hygiene Inspection Tool to Assess Hygiene Conformance Index of Street Food Vendors," Food Science and Technology, vol.113(1), pp.1-12, 2019.

[44] C. Hummel. "Disobedient Markets: Street Vendors, Enforcement, and State Intervention in Collective Action," Comparative Political Studies, vol. 50(11), pp. 1524–1555, 2017.

[45] S. Kamboj, N. Gupta, J.D. Brandral, G. Gandotra, and N. Anjum. "Food Safety and Hygiene: A Review," International Journal of Chemical Studies, vol. 8(2), pp. 358-368., 2020.

[46] A.S. Mohammed, and M.Z. Shehasen. "Street Food Consumption and Associated Health Risk," International Journal of Research Studies in Agricultural Sciences, vol. 6(1), pp. 8-18, 2020.

[47] T. Hossen, J. Ferdaus, M. Hasa, N.N. Lina, A.K. Das, S.K. Barman et al. "Food Safety Knowledge, Attitudes, and Practices of Street Food Vendors in Jashore Region, Bangladesh," Food Science and Technology, vol. 41(1), pp. 226-239, 2021.

[48] T. Alemayehu, Z. Aderaw, M. Giza and G. Diress. "Food Safety Knowledge, Handling Practices and Associated Factors Among Food Handlers Working in Food Establishments in Debre Markos Town, Northwest Ethiopia, 2020: Institution-Based Cross-Sectional Study,". Risk Management and Healthcare Policy, vol.14, pp.1155–1163, 2021.