

## **Assessment of Food Safety Knowledge and Hygiene Practices among Food Vendors of Street Food Trucks in, at Makkah, Saudi Arabia 2021.**

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### **ABSTRACT**

#### ***Background:***

Food Safety Knowledge and Hygiene Practices Among Food Vendors of Street Food Trucks in, at Makkah. The Center for Disease Control and Prevention (CDC) reported that around 9.4 million illnesses occurring in the yearly are caused by foodborne diseases. Additionally, more than 839 foodborne disease outbreaks were reported in 2016, resulting in over 14,000 illnesses, 800 hospitalizations, and even worse, 17 deaths. Moreover, the World Health Organization (WHO) also evaluated that around 600 million citizens experience symptoms of various sicknesses after consuming contaminated food. In addition to this, more than 420,000 deaths occur yearly, resulting in a reduction of 33 million life-years. The popularity of street food in both developed and developing countries is seen as a major concern because of its potential harmful effects on public's health and well-being, implying that proper food safety knowledge and hygienic practices must be observed among street food vendors. However,

only limited related studies have been conducted in Saudi Arabia. Food vended on the streets, otherwise known as "street food," includes meals and beverages that can be easily prepared and sold by vendors along the streets and crowded areas.

**Aim of study:** To Assessment of Food Safety Knowledge and Hygiene Practices Among Food Vendors of Street Food Trucks in, at Makkah, Saudi Arabia 2021.

**Methodology:** In this cross-sectional study, a total of 200 food vendors in street food trucks in Makkah, City, Saudi Arabia, from May to September 2021 were given self-administered questionnaire to evaluate their socio-demographic, employment profile and food safety knowledge. Furthermore, observational checklist was used to evaluate food vendors' personal and environmental hygienic practices in street food trucks.

**Results:** There were 200 participants, and the majority age were (44.0%) in (25-35) years. The majority of them were male (76.0%), while female (24.0%). The most of the participants were widow (49.0%), have education Senior Secondary and more were (58.0%), regarding Type of vendor the majority of participants Stationary were (85.0%), regarding Duration of being street vendor (in years) the majority of participants Less than a year were (53.0%). regarding Place of preparation of food the majority of participants Both were (55.0%).

**Conclusion:** Socio-demographic and employment characteristics of food trucks street vendors revealed a substantial effect on their food safety. Thus, continuous efforts to educate and guide food handlers on the proper safety protocols should be enhanced.

**Key words:** Food Safety, Knowledge, Hygiene, Practices, Food Vendors, Food Trucks.

## 1. INTRODUCTION

### 1.1 Background

Street-vended food, otherwise known as "street food," includes meals and beverages that can be easily prepared and sold by vendors along the streets and crowded areas. However, this classification is not limited to these products. The World Health Organization (WHO) also categorizes fresh fruits and vegetables marketed in front of legal grocery stores under this classification. Contrary to its given name, these meals and beverages do not necessarily have to be sold along the streets. They may also be vended in food trucks or carts that can be found in front of various malls or crowded areas.(1)

Because of their accessibility and affordability, these meals, snacks, and beverages have become widely popular over the years as millions of people worldwide consume these products. But with the increasing demand for street food, it has now become a primary

concern for food security and public health. When these meals and beverages are improperly handled and delivered to the public, they may become carriers of foodborne diseases. As a matter of fact, Wetuhafifa et al noted that the prevalence of these health issues is due to the food vendors' low knowledge about basic food safety protocols (2).

Foodborne diseases continue to be a global public health problem with an estimated 600 million people falling ill annually. In return, international standards are becoming stricter which poses challenges to food trade. Various factors may cause foodborne diseases in a food service environment. For instance, a food vendor's poor personal hygiene may be one of the most common reasons for this issue. Furthermore, when the ingredients of these meals and beverages are procured from unsafe sources, they may become possible carriers of harmful bacteria or substances. (3)

Street foods and foods prepared largely do not usually meet the proper hygiene protocols, leading to increasing numbers of diseases and other accompanying consequences on trade and development. In the Delhi five TVCs have been proposed – one each under the East, South and North corporations, Delhi Cantonment Board (DCB) and New Delhi Municipal Council (NDMC). The new Act proposes to streamline the entire street vending system in Delhi as there will be a concrete list of registered vendors (4-5). For instance, the most known sickness from food contamination is associated with diarrheal diseases. More than 550 million people were experiencing such condition, while more than 230,000 deaths occur every year. The global burden of foodborne illness caused by microbial and chemical contamination of food is considerable, particularly children <5 years of living in low-income regions of the world (6-7).

In addition, the prevalence of these foodborne diseases is not limited to developing countries. Food contamination also occurs in developed and industrialized nations. For instance, the Center for Disease Control and Prevention (CDC) reported that around (8.9) million illnesses occurring in the United States yearly are caused by foodborne diseases. Additionally, more than 839 foodborne disease outbreaks were reported in 2016, resulting in over 14,000 illnesses, 800 hospitalizations, and even worse, 17 deaths. With all the above-mentioned alarming statistics, retail food services must ensure the quality and safety of their products. Employees and owners must closely regulate and monitor the food safety protocols in their operations, including how their meals are prepared and delivered to the public. Hence, this research aims to gain insights about the food safety knowledge and hygiene practices of food vendors in street food trucks in Makkah City, one of the biggest tourist cities in The Kingdom of Saudi Arabia.

## Literature review

Previous related literature showed the relation between the importance of proper and adequate food safety knowledge among street food handlers worldwide, and its impact on their hygienic practices. The following section outlines the notable results in line with this study.

In 2016, a study stated that foodborne diseases are among the most common illnesses caused by food contamination. What is worth mentioning, fast food industry has speedily increased correspondingly, which also contributes to higher sugar and fat intake (9). In line with this, Fung et al. noted that contaminated food results in millions of illnesses worldwide, with hundreds of thousands of deaths every year. Such study also showed that this issue mostly impacts the disability-adjusted life years (DALYs) for children aged 5 years old and below. Their study described the four primary concerns regarding food safety challenges, namely microbiological, chemical, and personal and environmental hygiene safety. The first two of which are similar to the findings of the previous study. In addition, the food handlers' personal hygiene, as well as the food service's environmental sanitation, are also significant factors that should be considered when dealing with food safety (10).

According to WHO, food safety is essential in preventing the prevalence of foodborne diseases, and symptoms such as stomach pains, vomiting, and diarrhea. Hence, food handlers must know the general food safety practices to ensure that their meals and beverages are safe for human consumption. The core protocols for safer food include proper storage, preparation, and delivery, as well as good hygiene and sanitation (11).

However, these practices are often overlooked by both food service employees and their owners. Related studies conducted in China and Ghana showed several common unhygienic handling activities done by food handlers. These include inadequate hand washing, ineffective protection from flies and other unwanted pests, and the inefficient wearing of masks, gloves, and hair cap (12, 13).

Because of its accessibility and affordability, the demand and popularity for street food have been continuously increasing. However, food safety has also become a common issue among these meals and beverages as they may pose massive health risks to consumers. As a matter of fact, the findings of Trafiałek et al. in 2017 revealed that street food vendors had caused the greatest number of non-compliances to global hygienic standards. However, this research is limited to employees in Asia and Europe (14). In line with this, another cross-sectional study conducted by Trafiałek and colleagues (14) in Greece showed the impact of being

knowledgeable about food safety among the hygiene practices of food vendor. Among the 110 participating street food vendors, several showed non-compliance with the recommended food safety protocols. Furthermore, their findings manifested the need to implement and manage food safety and hygienic practices compliance better. Nevertheless, this study does not explain the factors that could impact this non-compliance (15).

analyzed knowledge, attitudes and practices of food hygiene among mobile food vendors in Nigerian rural settlement and discovered that: vending business was women dominated (94.1%), and that there was a strong evidence of association between knowledge of food hygiene and attitudes towards food hygiene. In Philippines, Alamo-Tonelada et al (2018) studied sanitary conditions of food vending sites and food handling practices of street food vendors and basically found out that: street food vending is women dominated (60%), 80% of vendors did not have any training in food safety while 50% of the street food vendors had attained secondary education (16, 17) .

### **Rationale**

Food safety is a critical issue that must be closely regulated and monitored in every aspect, including its delivery to the public. When implemented negligently, the health and wellness of the people concerned may be hampered. Therefore, the findings of this research may pave the way for the authorities to evaluate the current situation of the food vendors of street food trucks in Makkah, Saudi Arabia 2021. With the insights concerning food safety knowledge and hygiene practices of the food trucks vendors, authorities may establish and implement policies and regulations to assist, monitor, and control food vendors of street food trucks in Makkah, City.

### **Aim**

To Assessment of Food Safety Knowledge and Hygiene Practices Among Food Vendors of Street Food Trucks in, at Makkah, Saudi Arabia 2021..

### **1.4 Objectives**

1 - To Assessment of Food Safety Knowledge and Hygiene Practices Among Food Vendors of Street Food Trucks in, at Makkah, Saudi Arabia 2021.

## **METHODOLOGY**

### **Study Design :**

The research utilized a cross-sectional analytic study design, following the use of self-administered questionnaire to assess the knowledge of the participating food vendors in food

safety in street food trucks, and the use observational checklist to evaluate their hygiene practices.

### **Study Area:**

The research was implemented to analyze the food safety comprehension and hygiene practices of vendors in street food trucks present along the streets and several public spaces, such as in front of various malls and the walkways of different districts and beaches in Makkah, Saudi Arabia<sup>2021</sup> City, one of the largest and most popular tourist destinations in Saudi Arabia.

### **Study Duration:**

The research was carried out two months after the authorization of the Institutional Review Board (IRB). Thus, the data was mainly collected from July 2021 during the following seasons: the Ramadan Holy month, summer, and throughout the Ministry of Entertainment events, which was known to be the optimum period when these food trucks are present in Makkah, Saudi Arabia<sup>2021</sup> City, Saudi Arabia.

### **Study Population**

According to the official database of the Ministry of Municipality and Rural Affairs, there are a total of 200 registered and licensed food vendors in street food trucks in Makkah, Saudi Arabia<sup>2021</sup> City, Saudi Arabia, for the year 2021. This group was considered as the population of the study.

### **Eligibility Criteria**

**Inclusion Criteria:** Only food trucks that selling fast food and beverage along the streets and public spaces has be considered in the study. In addition to this, these food trucks must be mobile and situated in a consistent area.

**Exclusion Criteria:** All food trucks that are not selling fast food or hot beverages will not be included as well.

### **Sample Size**

From the given population, 20 vendors were selected to undergo a pilot study. The total sample size was then calculated using the equation  $n = \frac{N}{1 + N[(e)]^2}$  ", where N corresponds to the total population size and e for the margin of error at a 95% confidence interval. The results of which indicated a study group of 200 street food vendors. However, 11 refused to participate in the research, while the remaining 200 food vendors met the inclusion criteria.

### **Sampling Technique**

The principal investigator employed a random sampling technique in the main and known locations of food trucks in Makkah, Saudi Arabia 2021 City, specifically in front of various malls, cozy areas, and street district walkways.

## **Data Collection**

### **Data Collection Technique**

The researcher evaluate food safety knowledge and hygiene practice through observational checklist and self-administered questionnaire with the food vendors, like the techniques done in 2021 (18). Direct observations were employed during the inspections. Furthermore, the researcher used a checklist for quicker evaluation. Each observation was carried out for approximately 25 minutes and revolved around the delivery and the handling execution of the food vendors. Interviews with the stakeholders of these street food trucks were also done at the end of every inspection to prevent any possible changes with the food vendors' behavior and food handling practices upon being aware of the observation.

### **Data Collection Tool**

A questionnaire was created by the principal investigator and filled by principal investigator and a medical colleague who was trained in conducting inspections and in using a hygienic practice checklist. The questionnaire was based on the following references: the International Codex Alimentarius of Regional Code of Hygiene Practice for Street Vended Food in Asia, which was embraced by the World Health Organization and the Food and Agriculture Organization of the United Nations in 2017 (18), the National Food Truck Guidelines on Practices and Hygiene Requirement for Food Vendors in Street Food Trucks in Saudi Arabia in 2021 which proposed by Ministry of Municipality and Rural Affairs (18) and Akabanda F. in 2017 (12)

The questionnaire consisted of three sections. Section one was designed to measure the socio-demographic data of food vendors in street food trucks. This part gathered information concerning the food vendor's age, gender, marital status, educational attainment, nationality. It was also used to quantify the employment characteristics of food handlers in street food trucks, such as their duration of being a vendor, kind of vendor, place of preparation of food, previous food safety training, worker health certificate, license.

On the other hand, section two of the questionnaire dealt with the street food vendor's food safety knowledge. It was composed of 25 statement prompts with three viable responses, namely "True", "False" and "Do not know". In this study, every True remark was considered correct and awarded with one point. Meanwhile, every incorrect answer (No or Do not know) was not given any merits.

Lastly, the questions that belonged to section three contained a checklist of food hygienic practices among food vendors in street food trucks. This part was divided into two categories: the food preparation, equipment, environment checklist, and the personal hygienic practices checklist. The latter was composed of 40 checklists with two possible answers: "Yes" or "No." Like the previous technique, every Yes response was considered correct and awarded one point. Meanwhile, every incorrect answer (No) was not given any merits.

### **Pilot Study**

An initial study was carried out on 10% of the total sample size in street food trucks to guarantee that all the proposed prompts in the survey were clear and concise. Twenty food vendors tested the readability and accuracy of the Arabic questionnaire that was translated using the Back-to-Back technique. The researcher then conducted the Cronbach analysis to assess the said questionnaire's reliability and obtained a result of 0.7. Its content was also validated by three experts in the same field of the study. Furthermore, the data from the initial study were excluded.

### **Statistical Analysis**

The data for this study was examined using the IBM SPSS version 23. Simple descriptive statistics was used to demonstrate the nominal and categorical study variables through counts and percentages. Meanwhile, continuous variables were shown using the mean and standard deviations. Two scores are calculated and used as the main variables for correlation. These variables are calculated as follows:

- Descriptive statistics was utilized to evaluate the mean and the standard deviation of continuous independent variables (age, duration of being a street vendor), the frequency and the percentage for nominal independent variables (gender, marital status, level of education, nationality, kind of vendor, , place of preparation of food, previous food safety training, worker health certificate, license and
- A separate descriptive statistics test was conducted to evaluate the frequency and the percentage of food safety knowledge and overall food safety knowledge (Poor -satisfactory to Good) among food vendors in street food trucks. Similarly, another descriptive statistics test was employed to assess the frequency and the percentage of food hygienic practices and overall food hygienic practices (Poor to satisfactory level to Good) among food vendors in street food trucks.
- Another bivariate analysis was employed to determine the relationship between the personal hygiene practices and food safety knowledge of the participants. The chi-square test at a 95%



confidence level was then used to assess the gathered data, and variables with a P-value of  $\leq 0.05$  was counted as significant.

### Ethical Consideration

After approval from the Ethical Review Committee of the Makkah, Saudi Arabia 2021 Health Affairs of Ministry of Health and Jeddah municipality and rural affairs, the principle investigator requested permission to conduct interviews with food vendors in street food trucks. The researcher practiced proper decorum throughout the entire data collection period. A brief introduction of his background and the objectives and purpose of the research was done. The participants were reminded of the time requirement at the beginning of the interview. They were also assured that they would not be subjected to any undue discomfort throughout the discussion. Lastly, the street food vendors were guaranteed the confidentiality of all the information they had provided.

### 4.13 Budget It will be self-funded

## 5. Result

**Table 1. Distribution the Socio-demographic and employment characteristics among street food vendors (n=200)**

	N	%
<b>Age (in years)</b>		
<25	52	26
25-35	88	44
>35	60	30
<b>Gender</b>		
Male	152	76
Female	48	24
<b>Marital Status</b>		
Single	68	34
Married	80	40
Divorced	22	11
Widowed	98	49
<b>Level of Education</b>		
Primary	16	8

Secondary	68	34
Senior Secondary and more	116	58
<b>Type of vendor</b>		
Stationary	170	85
Mobile	30	15
<b>Duration of being street vendor (in years)</b>		
Less than a year	106	53
1-3 years	94	47
<b>Place of preparation of food</b>		
Truck	90	45
Both	110	55

There were 200 participants, and the majority age were(44.0%) in (25-35)years. The majority of them were male(76.0%), while female(24.0 %). The most of the participants were widow(49.0%), have education Senior Secondary and more were(58.0%), regarding Type of vendor the majority of participants Stationary were(85.0%), regarding Duration of being street vendor (in years) the majority of participants Less than a year were(53.0%). regarding Place of preparation of food the majority of participants Both were(55.0%).

**Table 2. Distribution the Percentage of food safety knowledge**

Food Safety Knowledge	Yes		No		Chi-square	
	N	%	N	%	X <sup>2</sup>	P-value
All food should come from KSA FDA approved source	196	98	4	2	184.320	0.000
The raw food should be free from signs of apparent change in color, taste, smell & textures	182	91	18	9	134.480	0.000
Growth of microorganisms is faster at room temperature than refrigerator	192	96	8	4	169.280	0.000
Cutting board should be separated for raw & cooked food	186	93	14	7	147.920	0.000
Should not use heavy metal utensils.	162	81	38	19	76.880	0.000

Should not use knives with wooden knobs	150	75	50	25	50.000	0.000
It is safer to cook food according to the estimated daily need	154	77	46	23	58.320	0.000
Food should be cooked at temperature not less than 70 ° C	136	68	64	32	25.920	0.000
Raw food should be stored in a refrigerator at a temperature of 4 ° C or below	132	66	68	34	20.480	0.000
Food handlers must have valid health certificates indicating that they are free from infectious diseases	182	91	18	9	134.480	0.000
Food handlers should have short & clean nails	176	88	24	12	115.520	0.000
Sick food handlers can be a source of foodborne outbreaks	172	86	28	14	103.680	0.000
Cooked food should not be tasted by fingers or unclean spoon	166	83	34	17	87.120	0.000
Flies or vectors or rodents in or around the stall increase the risk of food contamination	174	87	26	13	109.520	0.000
Dust & dirt in around the stall increase the risk of food contamination	180	90	20	10	128.000	0.000
Washing utensils with detergents leaves them free of contamination	176	88	24	12	115.520	0.000
Should be taken leave from work in case of infection disease of the skin	186	93	14	7	147.920	0.000
HIV cannot be transmitted by food	182	91	18	9	134.480	0.000
Food handlers should have health check-ups every two years	174	87	26	13	109.520	0.000
Washing hands before work reduces the risk of food contamination	190	95	10	5	162.000	0.000
Improper heating of food causes food borne illnesses	156	78	44	22	62.720	0.000
Food contamination increases when food handler eats and drinks in the workplace	178	89	22	11	121.680	0.000

Food contamination is minimized when gloves are used during work	194	97	6	3	176.720	0.000
Other food items like vegetables can be stored together with meat in the freezer	198	99	2	1	192.080	0.000
Hepatitis A virus is a food born pathogen	174	87	26	13	109.520	0.000

Regarding Food Safety Knowledge all item of food safety knowledge all food should come from KSA FDA approved source, the raw food should be free from signs of apparent change in color, taste, smell & textures, Growth of microorganisms is faster at room temperature than refrigerator, Cutting board should be separated for raw & cooked food, Should not use heavy metal utensils, Should not use knives with wooden knobs, It is safer to cook food according to the estimated daily need, Food should be cooked at temperature not less than 70 ° C, Raw food should be stored in a refrigerator at a temperature of 4 ° C or below, Food handlers must have valid health certificates indicating that they are free from infectious diseases, Food handlers should have short & clean nails, Sick food handlers can be a source of foodborne outbreaks. Cooked food should not be tasted by fingers or unclean spoon, Flies or vectors or rodents in or, around the stall increase the risk of food contamination, Dust & dirt in around the stall increase the risk of food contamination, Washing utensils with detergents leaves them free of contamination, Should be taken leave from work in case of infection disease of the skin HIV cannot be transmitted by food, Food handlers should have health check-ups every two years, Washing hands before work reduces the risk of food contamination, Improper heating of food causes food borne illnesses, Food contamination increases when food handler eats and drinks in the workplace, Food contamination is minimized when gloves are used during work, Other food items like vegetables can be stored together with meat in the freezer, Hepatitis A virus is a food born pathogen. the majority of participant answer Yes respectively were (98, 91, 96, 93, 81, 75, 77, 68, 66, 91, 88, 86, 83, 87, 90, 88, 93, 91, 87, 95, 78, 89, 97, 99, 87) high percentage knowledge, while a significantly associated to their food safety knowledge (p-value < 0.001) and  $\chi^2$

(58.320, 25.920, 76.880, 50.000, 169.280, 147.920, 134.480, 184.320, 109.520, 115.520, 147.920, 109.520, 128.000, 87.120, 103.680, 115.520, 134.480, 20.480, 176.720, 192.080, 109.520, 121.680, 62.720, 162.000)

**Table 3. Distribution of the Percentage of hygiene practices checklist**

	Yes		No		Chi-square	
	N	%	N	%	X <sup>2</sup>	P-value
<b>Food hygiene production and environment</b>						
Raw and cooked food stored separately	168	84	32	16	92.480	0.000
Using separate cutting board for raw & cooked food	150	75	50	25	50.000	0.000
Cleaning of utensils & equipment's by using safe water	192	96	8	4	169.280	0.000
Drying of utensils & equipment's by using paper tissue	154	77	46	23	58.320	0.000
The production are hygienic	146	73	54	27	42.320	0.000
Production process functional well	160	80	40	20	72.000	0.000
Raw material stored in a proper temperature	156	78	44	22	62.720	0.000
Ready to eat product and waste stored separately	194	97	6	3	176.720	0.000
All utensils and equipment clean	156	78	44	22	62.720	0.000
It is possible to clean/disinfect the equipment	140	70	60	30	32.000	0.000
No mobile phone near cooking stoves	138	69	62	31	28.880	0.000
No insects or pests visible in the workplace	156	78	44	22	62.720	0.000
There is waste container covered by plastic bag	152	76	48	24	54.080	0.000
Served food in disposable covered plastic material	150	75	50	25	50.000	0.000
The facility walls clean, washable and nonabsorbent	140	70	60	30	32.000	0.000
The floor in clean condition	132	66	68	34	20.480	0.000
The package ,plate and cutlery clean	150	75	50	25	50.000	0.000
The food separated from the consumer in a way to exclude secondary contamination	154	77	46	23	58.320	0.000
There are no unauthorized people in the production area	178	89	22	11	121.680	0.000
There is separation of catering equipment during the preparation of the meal	174	87	26	13	109.520	0.000

<b>Personal Hygiene practice</b>						
Card	150	75	50	25	50.000	0.000
Washing hand	196	98	4	2	184.320	0.000
Wash frequent	150	75	50	25	50.000	0.000
Drying	130	65	70	35	18.000	0.000
Gloves Changing	110	55	90	45	2.000	0.157
Touching	178	89	22	11	121.680	0.000
Gloves wearing	194	97	6	3	176.720	0.000
Apron	152	76	48	24	54.080	0.000
Head cap	118	59	82	41	6.480	0.011
Mouth sheet	142	71	58	29	35.280	0.000
Jewelry	144	72	56	28	38.720	0.000
Eating	136	68	64	32	25.920	0.000
Smoking	152	76	48	24	54.080	0.000
Mobile	150	75	50	25	50.000	0.000
Earing pod	140	70	60	30	32.000	0.000
Payment transaction	130	65	70	35	18.000	0.000
Cough	176	88	24	12	115.520	0.000
Touching Face	158	79	42	21	67.280	0.000
Nails	138	69	62	31	28.880	0.000
Skin	176	88	24	12	115.520	0.000

Regarding Food hygiene production and environment . Raw and cooked food stored separately, Using separate cutting board for raw & cooked food, cleaning of utensils & equipment's by using safe water, Drying of utensils & equipment's by using paper tissue. The production are hygienic, Production process functional well, Raw material stored in a proper temperature, Ready to eat product and waste stored separately, All utensils and equipment clean, It is possible to clean/disinfect the equipment, No mobile phone near cooking stoves, No insects or pests visible in the workplace, There is waste container covered by plastic bag, Served food in disposable covered plastic material, The facility walls clean, washable and nonabsorbent, The floor in clean condition, The package ,plate and cutlery clean, The food separated from the consumer in a way to exclude secondary contamination, There are no unauthorized people in the production area, There is separation of catering equipment during

the preparation of the meal. The majority of participant answer Yes respectively were(84, 75, 96, 77, 73, 80, 78,97, 78, 70, 69, 78, 76, 75, 70, 66,75, 77, 89,87)high percentage Food hygiene production and environment,Regarding Food hygiene production and environment. Raw and cooked food stored separately, Using separate cutting board for raw & cooked food, Cleaning of utensils & equipment's by using safe water, Drying of utensils & equipment's by using paper tissue

The production are hygienic, Production process functional well, Raw material stored in a proper temperature, Ready to eat product and waste stored separately, All utensils and equipment clean, It is possible to clean/disinfect the equipment, No mobile phone near cooking stoves, No insects or pests visible in the workplace, There is waste container covered by plastic bag, Served food in disposable covered plastic material, The facility walls clean, washable and nonabsorbent, The floor in clean condition, The package ,plate and cutlery clean, The food separated from the consumer in a way to exclude secondary contamination, There are no unauthorized people in the production area, There is separation of catering equipment during the preparation of the meal. The majority of participant answer Yes respectively were(84, 75, 96, 77, 73, 80, 78, 77 ,66,75 ,70 ,75 ,76 ,78 ,69 ,70 ,78 ,97,) high percentage food hygiene production and environment, while a significantly associated to their food hygiene production and environment were p-value =0.001 and  $X^2$ 92.480, 50.000, 169.280, 58.320, 42.320 62.720,54.08050.000, 32.000, 20.480, 50.000, 58.320, 121.680,109.520 ,62.720,32.000 ,176.720 ,62.720 ,72.000.

### **Regarding Personal Hygiene practice.**

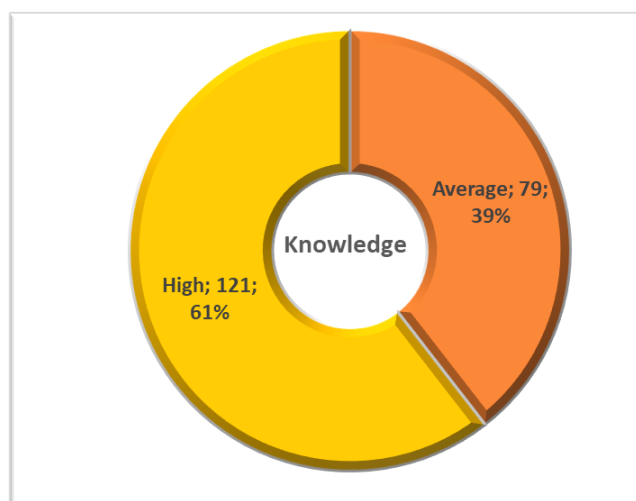
Card, washing hand, Wash frequent, Drying, Gloves Changing, Touching, Gloves wearing , Apron, Head cap, Mouth sheet, Jewelry ,Eating, Smoking, Mobile, Earing pod, Payment transaction, Cough, Touching Face, Nails, Skin. The majority of participant answer Yes respectively were(75, 98,75, 65, 55, 89, 97,76, 59,71, 72,68, 76,75,70,65, 88,79, 69,88), high Personal Hygiene practice, while a significantly associated to their food hygiene production and environment were (p-value < 0.001) and  $X^2$  50.000,184.320,50.000,18.000,2.000,121.680,176.720 32.000 ,50.000 ,54.080 ,25.920 ,38.720 ,54.080,6.480,35.280 18.000, 115.520, 67.280, 28.880,115.520

**Table 4: Distribution of the Food Safety Knowledge and Food hygiene Practices in Makkah Al-Mokarramah, 2021**

	Data		Chi-square	
	N	%	X <sup>2</sup>	P-value
Food Safety Knowledge				
Average	79	39.5	8.405	0.003*
High	121	60.5		
Food hygiene Practices				
Average	122	61	9.245	0.0024*
High	78	39		

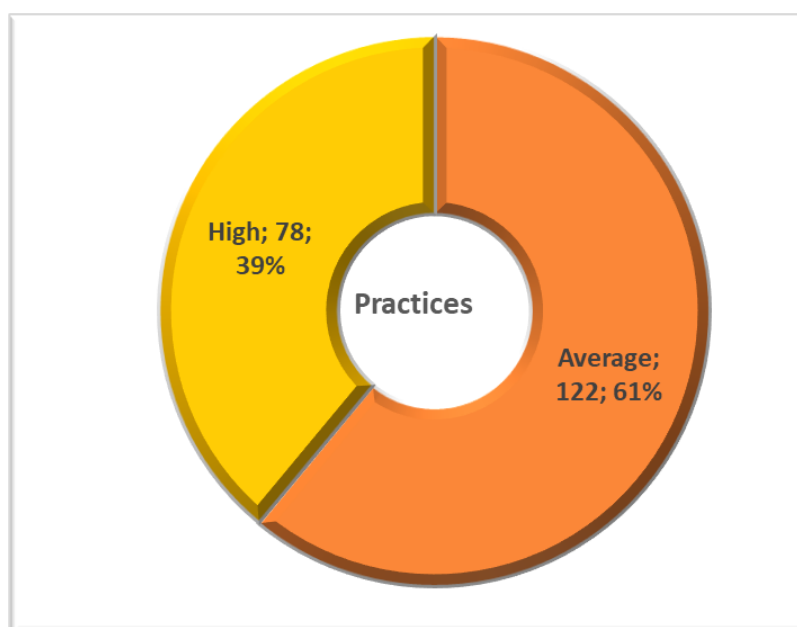
Table 4 shown, the results of the Food Safety Knowledge a significant high relation were (60.0%) while  $p=0.003$  and  $X^2 8.405$  while the results of the Food hygiene Practices a significant high relation average were (61.0%) while  $p=0.0024$  and  $X^2 9.245$ .

**Figure 1 Distribution of the Food Safety Knowledge in Makkah Al-Mokarramah, 2021**





**Figure 2 Distribution of the Food hygiene Practices**



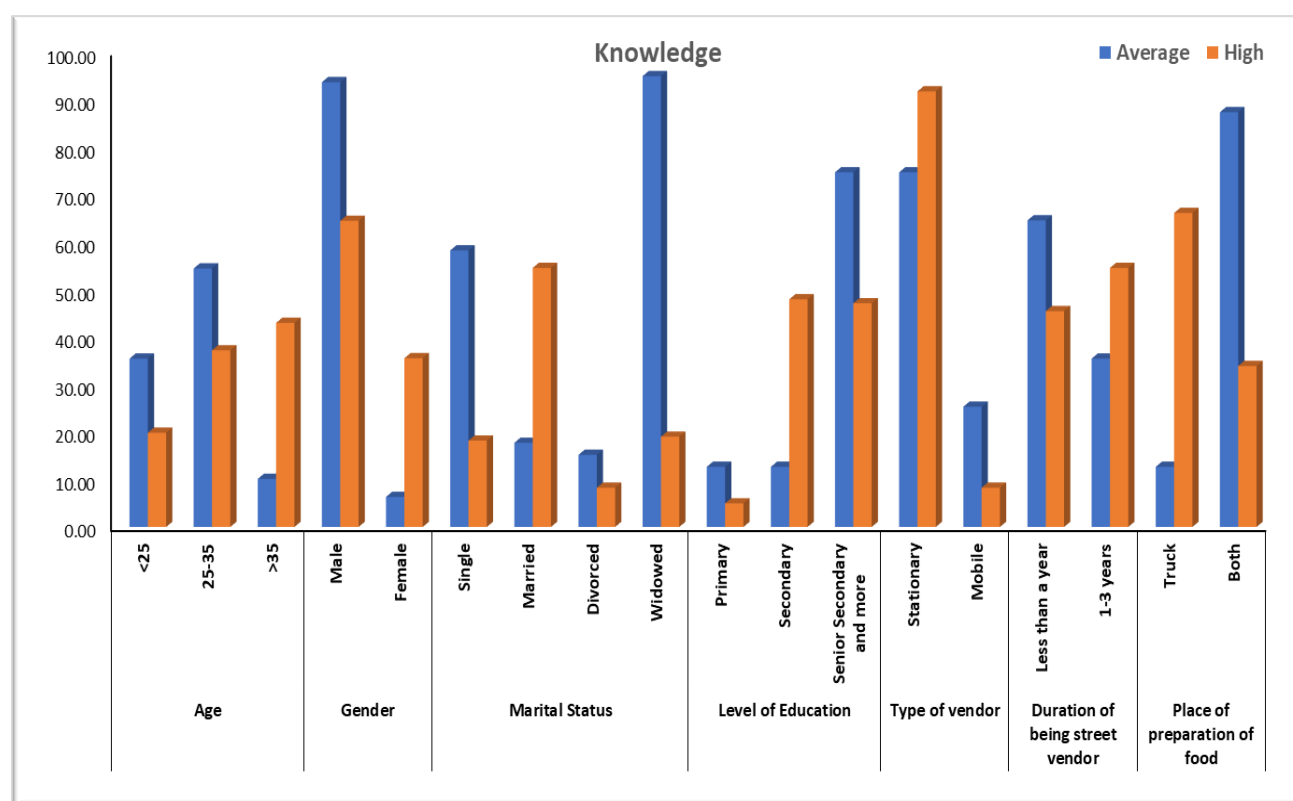
**Table 5 Distribution of the Association between level of food safety knowledge and socio-demographic .**

		Knowledge				Chi-square	
		Average		High		X <sup>2</sup>	P-value
		N	%	N	%		
Age	<25	28	35.44	24	19.83	24.898	<0.001*
	25-35	43	54.43	45	37.19		
	>35	8	10.13	52	42.98		
Gender	Male	74	93.67	78	64.46	22.354	<0.001*
	Female	5	6.33	43	35.54		
Marital Status	Single	46	58.23	22	18.18	68.163	<0.001*
	Married	14	17.72	66	54.55		
	Divorced	12	15.19	10	8.26		
	Widowed	75	94.94	23	19.01		
Level of Education	Primary	10	12.66	6	4.96	27.301	<0.001*
	Secondary	10	12.66	58	47.93		
	Senior Secondary and more	59	74.68	57	47.11		

<b>Type of vendor</b>	Stationary	59	74.68	111	91.74	10.900	0.001*
	Mobile	20	25.32	10	8.26		
<b>Duration of being street vendor (in years)</b>	Less than a year	51	64.56	55	45.45	7.001	0.008*
	1-3 years	28	35.44	66	54.55		
<b>Place of preparation of food</b>	Truck	10	12.66	80	66.12	55.185	<0.001*
	Both	69	87.34	41	33.88		

Table 5 shows the relationship between the Knowledge and the socio-demographic and Knowledge regarding all variable of socio-demographic a significance, statistically significant association were found between the Knowledge and socio-demographic factors while p-value = 0.001 and increase in average rate and  $X^2$  were respectively 24.898, 22.354, 68.163, 27.301, 10.900, 7.001, 55.185

**Figure 3 Distribution of the Association between level of food safety knowledge and socio-demographic**

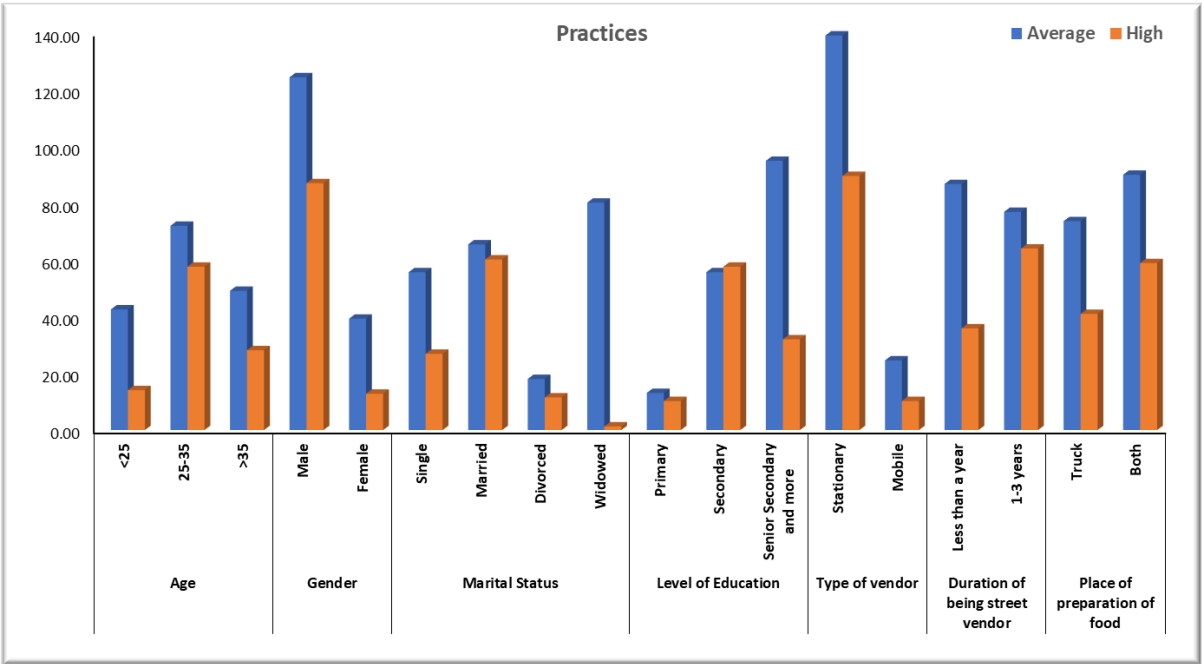


**Table 6 Distribution of the Association between level of food safety Practices and socio demographic**

		Practices				Chi-square	
		Average		High		X <sup>2</sup>	P-value
		N	%	N	%		
<b>Age</b>	<25	41	42.62	11	14.10	11.531	0.003*
	25-35	43	72.13	45	57.69		
	>35	38	49.18	22	28.21		
<b>Gender</b>	Male	84	124.59	68	87.18	0.816	0.366
	Female	38	39.34	10	12.82		
<b>Marital Status</b>	Single	47	55.74	21	26.92	17.271	0.001*
	Married	33	65.57	47	60.26		
	Divorced	13	18.03	9	11.54		
	Widowed	97	80.33	1	1.28		
<b>Level of Education</b>	Primary	8	13.11	8	10.26	36.769	0.000*
	Secondary	23	55.74	45	57.69		
	Senior Secondary and more	91	95.08	25	32.05		
<b>Type of vendor</b>	Stationary	100	139.34	70	89.74	37.423	0.000*
	Mobile	22	24.59	8	10.26		
<b>Duration of being street vendor</b>	Less than a year	78	86.89	28	35.90	11.494	0.001*
	1-3 years	44	77.05	50	64.10		
<b>Place of preparation of food</b>	Truck	58	73.77	32	41.03	8.762	0.003*
	Both	64	90.16	46	58.97		

Table 6 shows the relationship between the Practices and socio-demographic. Practices regarding all variable of socio-demographic the majority of variable a significance, statistically significant association in the average were found between the Practices and socio-demographic factors while p-value = 0.001 and increase in average rate and expect Gender no significant association X<sup>2</sup> were respectively 11.531, 0.816, 17.271, 36.769, 37.423, 11.494, 8.762

**Figure 3 Distribution of the Association between level of food safety Practices and socio demographic**



**Discussion**

With the increasing demand and popularity for street food, its safety becomes a general concern for the public. Previous related literature reported the possible factors affecting food safety.Overall Food Safety Knowledge

The food safety knowledge of the vendors in street food trucks resulted in an overall good score, suggesting that the participants had a prior background with such matter. Furthermore, the resulting high rate also implies complicate on practicing food safety protocols during the procurement and storage phases. Majority of the participants were aware that their sourcing and storage practices may affect the quality of the food and boost the growth of microorganisms. Among these activities include whether the raw materials were procured from credible sources , and the impact of leaving such ingredients unattended at room temperature . This finding is consistent with the previous related Literatures (19) and (20,12), reporting significant mortality and morbidity rates globally with food contamination, as well as the four primary challenges concerning food safety, namely microbiological, chemical, personal, and environmental hygiene. Furthermore, these findings are in accordance with the study of de Freitas and coworkers (2019)(22), which revealed poor results on food handling protocols, particularly from the ingredients' procurement to the management of leftovers in Jizan City. Although the respondents in the said study belong to same age group and marital

status, only 50 street food vendors were interviewed, which is only half the number of the total respondents in the current study .

This is comparable with the food safety protocols set by WHO, particularly proper storage, preparation, and delivery, as well as good hygiene and sanitation (23). The studies of Ma , et al. (13) and Akabanda, et al. (12) which were done in China and Ghana revealed common unhygienic handling activities done by food handlers. These include inadequate hand washing, ineffective protection from flies and other unwanted pests, and the inefficient wearing of masks, gloves, and hairnets. However, it is important to note that not much study was done among street food vendors in Saudi Arabia to generalize this claim. This result is supported by another literature (24), conducted in King Saud University, Riyadh City, indicating the need for better storage, preparation, and cooking skills in food service operations despite the employees' excellent food safety knowledge and hygienic practices. The studies of Alamo, et al. (21) and Lin and 22.de Freitas (23) emphasized the importance of educating food handlers concerning this matter for them to put their food safety knowledge into practice. Studies conducted from other countries, have also reported the inadequate knowledge of food with temperature controls (24, 25). These findings can be attributed to their lack of resources, namely their cutlery and storage equipment.

Personal hygiene practices are critical to preserve the safety and quality of food. Although this percentage is relatively satisfactory level, this may still be quite concerning, especially since the improper handling of food is among the primary causes of foodborne diseases. Furthermore, poor hand washing can heighten the prevalence of food contamination as mentioned in study conducted by the Food and Agriculture Organization of the United Nations (26,27)

InMalaysia, indicating that there is need for better awareness programs despite having satisfactory findings with the overall understanding (23,28)

## **Conclusion**

In this study, food truck street vendors in Jeddah City, Saudi Arabia, exhibited good food safety knowledge. was Analysis of socio-demographic characteristics revealed that educational attainment substantially impacted the level of knowledge regarding the basic protocols set by the World Health Organization (WHO). Also, the participating street food vendors were determined to have a satisfactory level among the given prompts. Nevertheless, these findings did not reflect into better food hygiene practices. Thus, an expanded and continuous food safety education and monitoring for food vendors situated in various public

spaces and districts in Jeddah City would further supplement other interventions that enhance food safety systems in street food vendors.

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