UDC (UDK) 338.439.544(532)

Elhaj MOUTZ,
Siham SULIMAN and Mohamed ABDALLA [1]

SURVEILLANCE OF FOOD SAFETY PRACTICES OF STREET FOOD- VENDORS IN GIZAN SAUDI ARABIA

ABSTRACT

The study was conducted to evaluate food safety knowledge and practices of street vendors in Gizan city, using standardized survey tool containing 25 questions to test food safety knowledge and practices of 50 street food vendors. The analysis of demographic characteristics revealed that all the participants were males and the majority of age group of 21-30 years (40%). Most of these vendors have primary school certificate (38%) and most of them are married (60%). Concerning health and personal hygiene knowledge these people agreed that hand washing was necessary (52%) and bathing regularly (74%). Also 76% of the respondents washing utensils with soap, but some of the participants were able to identify the term of food-borne illness and the most common contaminants were food colors, flavors and spices (70%). Sixty two samples of food were taken (30 grams) in sterile containers. Bacterial total viable count (TVCs) was carried out. The results of the TVCs revealed statistical significance difference of all types of food ($P>0.05$). Isolation and identification of bacteria in different types of food were *Staphylococcus aureus, Salmonella spp, Echerichia coli* and *Bacillus spp.* The saving of food hygiene is difficult to practice at street in settings where resources are scarce and surroundings are of low environmental and sanitary standards.

Keywords: food safety, street food-vendors, Saudi Arabia

INTRODUCTION

There are increased interests worldwide on the importance of street food as part of general concern for food security and health. During the last few decades the street sector has expanded rapidly in urban areas as a result of great demands both in terms of providing access to a wide variety of food and inexpensive food for low-income household (Maxwell et al, 2009).In the industrials countries the percentage of people suffering from food borne diseases each year represent 30% of people (WHO, 2007).

Street food trade in Saudi Arabia often flourish during Hajj and Umrah seasons, large numbers of Muslims visit KSA every year to perform pilgrimage and estimated by 2.5 million of people from abroad and inside Saudi Arabia

[1] Elhaj MOUTZ, Siham SULIMAN Department of Preventive Medicine, College of Veterinary Medicine, Sudan; Mohamed ABDALLA (correspondent author: salamaa2000@sustech.edu) University of Science and Technology P.O. Box 204, Khartoum North, Sudan

gathering in Mecca city such a large number depend a lot on street vendors who they advertising their products on sidewalks almost everywhere in this city. They operate their businesses in unhygienic conditions and compromise food safety for financial issues. In addition to that ignoring hygienic measures in food premises and lack of cooling and heating facilities amplified the public health risks. The crowdeness of pilgrims and the great demand for fast food forced pilgrims to have their meals in unsanitary conditions, such situation exposed them to microbial hazards and risks of foodborne diseases (FETP, 1998). While some street vendors were not implementing their knowledge into practices and perceived that they produce safe food for consumers (Subrathy et al, 2004). In some cases of the food safety knowledge of street food vendors could not be translated to practices due to the absence of basic facilities and infrastructures such as water and toilets at their vending sites (Omema and Aderoju, 2008; Abdalla et al, 2008; Abdalla et al, 2009). A study involved a field survey and food sample assessment was conducted to evaluated knowledge, attitude and practices of food handlers found that the age, gender and education at level of handles did not influence their food hygiene practices (Annor and Baiden, 2011). Isara and Isaah (2009) described cross- sectional study to assess knowledge and practice of food hygiene and safety. The results showed that the good knowledge regarding food safety and hygiene did not influence by the level of education, but influenced by past training and duration of working experience in food hygiene and safety. Rane (2011) mentioned that the major sources contributing to microbial contamination and the place of property, utensils for cooking and serving, personal hygiene, raw materials, food preparation, storage and reheating, time and temperature abuse of cooked foods, and waste disposal. In most cases food workers have been responsible for food borne disease out breaks, the microbial agents can be transferred to and from workers through contact with raw foods specially those of animal origin, hands (including dirty fingernails, rings, fabrics, currency and jewelry), clothing, aerosols, vomits, dust, exposed hand lesions, this transmission depends on the species of microbial agents, the inoculums delivery route, type of surface contact, time temperature control and relative humidity (Abdalla et al, 2009; Todd et al, 2009). The relation between street vended food and illness in cross- sectional study by comparing 128 street food vendors with 47 food handlers from restaurants and the results poor hand washing hygiene among vendors, no educational level and faecal contamination was found in 65 of drinking water samples, 91% of dish water and all samples of ice cups (Vollaard et al, 2004).

The aim of the investigation to determine the level of food safety knowledge and practices and availability of bacteria in this food.

MATERIAL AND METHODS

Population and location - The population of this study consisted of 50 street vendors who operating their businesses in the major streets, public places, sidewalk, stadiums and markets. Types of vending sites encompass, stalls, push-carts, truck, vehicles, baskets and road side stands in Gizan city-Saudi Arabia.

Questionnaire design and data collection - The questionnaire issued was consisted of 25 questions (FDA, 2003). These questions consisted of demographic characteristics of the participants and the socio-economic street information, health and personal hygiene knowledge food handling practices and food borne illness.

Source of food samples - A total of 62 samples of food (each 30 grams) were collected from cooked vegetable, soup, meat, chickens, fish…etc., bean, juice and roasted ground vended in the street of Gizan city. The bacterial total viable count was used according to methods of Barrow and Feltham (2003). The morphological features of the colonies (size, colour, odor and sphape) were examined after culturing of the samples on MacCkonkey agar, nutrient agar and blood agar. Gram stain was done according to the method described by Cheesbrough (2005). Entero pluri test was used for identification of the Enterobactercae. The test based on biochemical test performed on culture media containing specific substrates. The combinations of positive and negative reactions allow building up a code number that permits to identify bacteria by the codebook (Liofilchem Bacteriology Products Via Scozia Zona Ind. Le-64026 Rosetio D.A- Italy). Indole and catalase tests were also used (Barrow and Feltham, 2003).

Data analysis - The data were analyzed with SPSS soft ware (statistical package for the social sciences version 20, IBM/SPSS). Statistical significance was set at P value of > 0.05.

RESULTS AND DISCUSSION

The results of analysis of the demographic characteristics of the participants revealed that all vendors (Table 1) questioned were males and the majority of age group of 21-30 years (40%) (Fig I). Most of respondent (38%) had primary school certificate, 34% of them had secondary school certificate and 24% were illiterated but only 4% of them held diploma. But most of the vendors were married (60%) and 32% of these people were single, whereas 2% of them were separated. Twenty eight of vendors were mobile (56%), but 486% of these respondents were had no health certificate. A variety of prepared street food sold by vendors including cooked meals, bean, snacks, bottle drink, Juices and roasted groundnut (Fig.2). Concerning health and personal hygiene (Table2) knowledge these people agreed that hand washing was necessary (52%) and bathing regularly (74%). Also 86% of the respondents washing hands with soap, but 12% drying them with clean cloths (Table3). Knowledge of food-borne and their related symptoms and contaminants were shown in Table4. About 72% of the participants were able to identify the term of food-borne illness and the most common contaminants were food colours, flavors and spices (70%). Table 5 summarized statistical significant difference of all type of food (P>0.05), but the TVCs in juice reach 5.8± 1.8CFU/ml higher than other types of food.

Isolation and identification of bacteria in different type of food investigated revealed 4 species of bacteria as shown in Table 6. *Staphylococcus*

aureus in cooked Food 17.7%, juice 14.5% and roasted groundnut 11.3%. *Escherichia coli* were 17.7% and 11.3% in bean and juice respectively. *Salmonella spp* 14.5% detected only in cooked food. Also *Bacillus spp* was isolated from cooked food 11.3% and roasted groundnut (13.0%).

Table 1. profile of street vendors studied in Jazan city

Parameters	Frequency	Percentage (%)
Sex		
Male	50	100.0
Female	0.00	0.00
Educational attainment		
Illiterate	12	24.0
Primary	19	38.0
Secondary school	17	34.0
Diploma	2	4.0
Marital status		
Married	33	66.0
Single	16	32.0
Separated	1	02.0
Types of vendors		
Mobile	28	56.0
Stationary	22	44.0
Health certificate		
With	26	52.0
Without	24	48.0
Length of time spent vending (Year)		
<5	31	62.0
6-10	8	16.0
>20	11	22.0
Acquisition of knowledge of food preparation		
Through observation	37	74.0
Others	13	26.0

Table 2. Health and personal hygiene knowledge of street food vendors in Gizan city

Topics	Yes	No	No info
Hand washing is necessary for street vendors			
After touching money	20 (40%)	29 (58%)	1 (2%)
Even when handkerchief is used for sneezing	26 (52%)	19 (38%)	5 (10) %
Even when hands are not yet visible dirty during continuous food hand	25 (50%)	23(46%)	2(4%)
Street food vendors should			
Bath regularly	37(74%)	12(24%)	1(2%)
Wear hair restraints and apron when vending	36(72%)	12(24)	2(4%)
Consider hand and arms jewelries as sources of contamination	24(48%)	25(50%)	1(2%)
Street food vendors cannot safely handle food			
When they have cold, cough, and catarrh	29(58%)	18(36%)	3(6%)
When sick with diarrhea even if hands are washed after the toilet	19(38%)	26(52%)	5(10%)
When they an open wound in hands even if it is fully bandaged	22(44%)	26(52%)	2(4%)

Table 3. Health and personal hygiene practice of street food vendors

Topics	Number of positive responses	Percentage (%)
1/ Alignments that temporarily prevented vendors from vending or cooking food		
Cough and colds	30	60
Diarrhea	34	68
Nausea	23	56
Vomiting	42	84
Sore eyes	33	66
Stomach cramps	25	50
Sick member of family	0	0
2/ Hand washing requirements		
Clean water	47	94
Soap	43	86
Clean hand towel	6	12
Disinfecting	4	8
3/ Reasons for hand washing		
Touching money	10	20
Handling garbage	43	86
Blowing of nose	42	84
After eating meals	45	90
After using the toilets	43	86
Handling raw food	21	42
Scratching	27	54
Contentious food handling	21	42

Table 4. Food contamination knowledge exhibited by street food vendors in Gizan city

Topics	Number	Percentage (%)
1/Familiarity with the term food-borne illness illness	36	72
2/ Types of food contaminants include		
Worms and parasites	9	18
Splinters of wood and shards of glass	31	62
Invisible germs in food	19	38
Kerosene oil, detergent, or other similar products	2	52
Food colouring, flavoring and spices	35	70
Insects, insects dropping and dirt	29	58
3/ Symptoms of food borne illness		
Stomach pain	33	66
Diarrhea	29	58
Vomiting	29	58
Nausea	32	64
Headache	16	32
4/ Types of food borne illness	15	30
Typhoid..from contaminated	22	44
Cholera from contaminated food and water	30	60
Dysentery from	10	20

The demographic data in this study revealed that all the food vendors were men, and the majority of them (40%) at age group of 21-30 years. This finding is similar to the findings of Panchal (2010). Also the results showed the absence of formal training and most of the vendors (74%) gained their knowledge of food handling and cooking skills through observation or taught by their parents, self taught, in addition 44% of these people operated their business from stationary establishments while 56% were mobile. These results are in contrast with findings reported by Chukuezi (2010) who found that 47.6% of the vendors acquired their knowledge of food preparation from observation or taught by their parents or self teaching, but only 4.76% were admitted formal training whereas these findings in agreement with Abdalla et al (2009). Furthermore, most the interviewers were had primary school certificate (38%) and they were married and working for less than five years (Abdalla et al, 2009).

Table 5. Mean ± Standard deviation level of total viable count (TVC) of bacteria (log_{10}/g(ml)) in street food vended in Gizan city

Type	Number of samples	Mean±S.D log_{10}/g(ml) TVC	Significance
Cooked vegetable, Soup, meat, Chicken, fish…etc.	22	3.48±3.1	*
Bean	24	4.6±0.52	*
Juice	13	5.8±1.80	*
Roasted groundnut	3	3.3±1.60	*

*There is a significant difference

Table 6. Isolated bacteria and identified in different street vended food Gizan city

Species / Type of Food	Isolated bacteria			
	Staph. aureus	*Salmonella spp*	*E.coli*	*Bacillus spp*
Cooked Food	11 (17.70%)	9 (14.5%)	0 (0.00%)	7(11.30%)
Bean	0 (0.00%)	0 (0.00%)	11(17.7%)	0 (0.00%)
Juice	9 (14.50%)	0 (0.00%)	7(11.3%)	0 (0.00%)
Roasted groundnut	7 (11.30%)	0 (0.00%)	0 (0.00%)	8(13.0%)

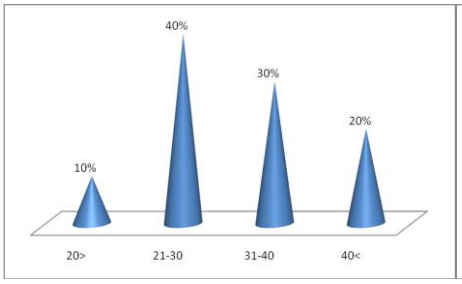

Figure 1. Demographic characteristics of age of food vendore in Gizan city

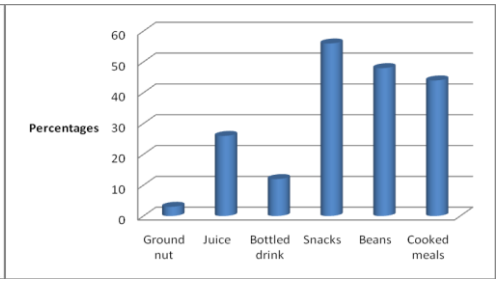

Figure 2. Types of street vended food in Gizan city

In the present data the respondents (52%) decided that hand washing is necessary and proper hand washing can reduce the risk of diarrheal and respiratory diseases (Stephen et al, 2005; Feglo and Nkansah, 2010). Also handlers are considered as contributing risk factor in food contamination and transmission of food borne disease to consumers (Jones and Angulo, 2006). In our survey (Table 4) the respondents decided that they cannot handle food safely when they sick with diarrhea or they have open wound or coughing and these could be a good source of infection which results in contamination of the products.

From these results, juice had mean score count (Table 5), this attributed to improper food handling practice (Vollaard et al, 2004; Abdalla et al, 2009).

Regarding microbial assessment of food samples, the study revealed that the bacteria isolated from all samples were *Salmonella spp E. coli, Staph. aureus* and *Bacillus spp.* This finding is similar to previous report by Edema and Omemo (2004). The most prevalent bacteria were *Staph. aureus* and it was detected in samples of cooked meals juice and roasted groundnut. The source of this organism usually a human carrier who neither avoiding serving food with bared hands nor followed adequate hygiene procedure, such as hand washing before preparing the food (Nester et al, 2004).

In general, the respondent's answers are good in some areas of personal hygiene practices, but there are also poorly answered in areas of health and personal hygiene knowledge. Furthermore, they have less adequate knowledge on topics of food handling practices specially questions that address source of raw foods, time temperature control of food, reheating, serving food and left-over management. The saving of food hygiene is difficult to practice at street in setting where resources are scare and surrounding area of low environmental and sanitary standards.

REFERENCES

Abdalla, M.A., Suliman, S.E., Alian, Y.Y.A., Bakheit, A.O (2008): A study of microbial content of the domestic refrigerators in Khartoum. *Sudan Journal of Veterinary Animal and Husbandry*, 47 (1-2) 15-23.

Abdalla, M.A., Suliman, S.E., Bakhiet (2009): Food safety knowledge and practices of street food-vendors in Atbara city (Naher Elneel State-Sudan). *African Jornal of Biotechnology* 8(24), 6967-6971.

Annor, G.A. & Baiden, E.A. (2011): Evalution of food hygiene knowledge attitudes and practices of food handlers in food businesses in Accra, Ghana. *Food and Nutrition sciences*, 2(8), 830-836.

Barrow, G.1. & Feltham, R.K.A. (2003): *Cowan and Steel's; Manual for Identification of Medical Bacteria*. Third Editson. Cambridge, University Press. PP216.

Cheesbrough, M. (2005): District Laboratory Practice in Tropical Countries, *Cambridge University Press* 2:62-70, 382-407.

Chukuezi, C.O. (2010): Food safety and hygienic practices of street food vendors in Owerri, Nigeria. *Studies in sociology of science*, 1(1): 50-57.

Edema, M.O. & Omemu, A.M. (2004): Microbiology and food hygiene in public food services. In proceedings of *international conference on science and National Development*. 25th -28th October: 25-29.

Field epidemiology training program (FETP) (1998): Behavioral risk factors for pilgrims to Makkah (1997). *Saudi epidemiology bulletin*, 5(1). http://www.fetp.edu.sa/seb/behavioral-risk-factors-pilgrims-makkah-1997.

Food and drug Administration Center for Food Safety and Applied Nutrition Food (FDA/CFSAN) (2003): *How can I prevent Foodborne illness*?

Feglo, P. & Nkasah,M. (2010): Bacterial load on Ghanian currency notes. *African Journal of Microbiology*, 4(22): 2375-2380.

Isara, AR. & Isaah, Ec. (2009): Knowledge and practice of food hygiene and safety among food handlers in fast food restaurants in Benin city, Edo state. *The Nigerian post graduate Medical Journal* 16 (3), 207-212.

Jones, T.F. & Angulo, F.J. (2006): Eating in restaurants: A risk factor for food borne disease. Oxford Journals, Medicine, (lyrical Infection diseases. 43(10): 1324-1328.

Maxwell, D.L.C., Armar-Klemesu, M.R., Prries, M., Ahiadekeet, S. (2000): *Urban livelihood and food and nutrition security in greater Acrra, Ghana*. International food Policy Research Institute, Research Report 112.

Nester, E.W., Anderson, D.G., Roberts, C.E.P. Nester, N.T. (2004): *Microbiology: A human perspective* 4th edition. McGraw Hill pp. 812.

Omemo, A.M. & Aderouju, S.T. (2008): Food safty knowledge and practices of street food vendors in the city of Abeokuta, Nigeria. *Food Control*, 19 (4)" 396-402.

Panchal, S.L. (2010): Street food in Delhi: Microbiological quality and hygiene Swarn research http://swaenreasearch. blogspot.com/2010/01/street-food-in-delhi-microbiological. Html.

Rane, S. (2011): Street vended Food in Developing world: Hazard Analysis. *Indian Journal of Microbiology*. 51(1): 100-106.

Saudi Food and Drug Authority (SFDA) (2009): Food safty during Hajj and Umrah seasons.

Stephen, P. L., Agboatwalla, M., Feirm, D.R., Painter, D., Billhimer, W., Hoeks, R. M. (2005): Effect of hand washing on child health: arandomized control trail. Lancet, 366:225-233.

Subratty, A. H. & Beeharry, P. (2004): A survey of hygiene practices among food vendors in rural areas in Mauritius. *Nutrition and Food Science*, 34 (5):20)-205.

Todd, E.C.D., Greig, J.D., Bartleson, C.A., Micheals, B.S. (2009): Outbreaks where food workers have been implicated in the spread of foodborne disease. Part6. Transmission and survival of pathogens in food processing and preparation environment. *Journal of food Protection*. 72(1): 202-219.

Vollaard, A.M., Ali, S., Vanasten, H.A.G.H., Suhariahismid, W.S., Visser, L.G., Vandissel, J.T. (2004): Risk factors for transmission of food borne illness in restaurants and street vendors in Jakarta, Indonesia. Commercial food handling and food borne illness. *Epidemiology and infection*, 132(5), 863-872.

WHO (2007): Food safety and food borne illness. Fact sheet N237 available at: /http: //www. WHO. Int/ mediacntre/ fact sheet/fs237/en/index.htm//.

Elhaj MOUTZ,
Siham SULIMAN and Mohamed ABDALLA

NADZOR PROCEDURA ZA BEZBJEDNOST HRANE KOD ULIČNIH PRODAVACA U GIZANU, SAUDIJSKA ARABIJA

SAŽETAK

Studija je sprovedena sa ciljem da se procijeni znanje o bezbjednosti hrane i praksa uličnih prodavaca u gradu Gizan. Korišćen je instrument standardizovane ankete koja sadrži 25 pitanja za testiranje znanja o bezbjednosti hrane i prakse koju primjenjuje 50 uličnih prodavaca prehrambenih proizvoda. Analizom demografskih karakteristika otkriveno je da su svi učesnici bili muškarci, većina starosne grupe od 21-30 godina (40%). Većina ovih prodavaca ima završenu osnovnu školu (38%) i većina je oženjena (60%). Što se tiče znanja o zdravlju i ličnoj higijeni, ispitanici su se složili da je neophodno redovno pranje ruku (52%) i redovno kupanje (74%). Takođe, 76% ispitanika pere pribor deterdžentom, a neki od učesnika su prepoznali određene termine za bolesti koje se prenose hranom i znali su da su najčešće kontaminante prehrambene boje, ukusi i začini (70%). Uzeta su šezdeset dva uzorka hrane (30 grama) u sterilnim kontejnerima. Sproveden je potpuno ostvariv proračun bakterija (TVCs). Rezultati TVCs su pokazali statistički značajnu razliku svih vrsta hrane (P> 0,05). Izolovane i identifikovane bakterije u različitim vrstama namirnica su Staphilococcus aureus, Salmonella spp, Echerichia coli i Bacillus spp. Očuvanje higijene hrane je teško održivo na ulici, u okolnostima koje prate oskudni resursi i niski ekološki i sanitarni standardi.

Ključne riječi: bezbjednost hrane, ulični prodavci hrane, Saudijska Arabija