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Full Length Research Paper

Food safety knowledge and practices of street food-vendors in Atbara City (Naher Elneel State Sudan)

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The study was conducted to evaluate the food safety knowledge and practices of street food vendors in Atbara city between March and April, 2008. The questionnaires respondents were 28% male and 72% were female, 48% of them had primary school education while 42% were illiterates. The most prevalent isolated bacteria from cooked meals, bottled drink and fresh juice were; *Escherichia coli*, *Staphylococcus aureus* and *Bacillus* sp. The viable bacterial counts were 4.6 CFU/ml, 3.7 CFU/ml and 4.1 CFU/ml for cooked meals, bottled drink and juice, respectively.

Key words: Street, food, vendors.

INTRODUCTION

The term "street food" refers to a wide variety of ready-to-eat foods and beverages sold and sometimes prepared, in public places. Street food may be consumed where it was purchased or can be taken away and eaten elsewhere (WHO, 1996). The established food safety know-how among the surveyed street food vendors regarding food contamination, types and symptoms of food diseases was significant since several pathogenic microorganisms had also been isolated from many street vended foods (Omemu et al., 2005). According to WHO (1989), food handling personnel play important role in ensuring food safety throughout the chain of food production and storage. Mishandling and disregard of hygienic measures on the part of the food vendors may enable pathogenic bacteria to come into contact with and in some cases survive and multiply in sufficient numbers to cause illness in the consumer. Tivadar (2003) highlighted the increasing prevalence of eating away from home and the use of partly or fully cooked food. Most of the vendors who sold both raw and cooked food items were not regulated; they operated haphazardly without any monitoring of what they prepared and how they prepared it (Ekanem, 1998; Abdalla et al., 2008b). Studies by FAO (1995) recorded poor knowledge, practices in food handling in the assessment of microbial contamination

of food sold by vendors.

This work was conducted to study the level of food safety knowledge, practices in food handling and assessment of microbial contamination of food sold by vendors.

MATERIALS AND METHODS

Study population and sample collection

The survey was conducted to evaluate the food safety knowledge and practices of street food vendors within Atbara city, Nahr Elneel. The study was carried out between March and April, 2008. Fifty food vendors operating in the major streets, open air market, schools, offices and the general hospital were randomly sampled for this study. The written questionnaire used in this study was a modified version of a questionnaire from the US Food and Drug Administration (FDA) on food safety, nutrition and cosmetics (FDA, 2003).

The respondents were 28% males and 72% females, but 38% of them of age 31-40 and 28% of them were 21-30 old. The education level of 48% of respondents was primary schools where as 42% were illiterate. Most of the surveyed people (64%) were married. The stationary vendors represented 90%. Sixty four percent of the respondents had the health certificates, where as 36% were not presented them. The vendors had been in food vending work for less than 5 years were 78%, but only 2% worked for more than 20 years.

The questionnaire was developed to collect data from street food vendors. The questionnaire was pre tested for clarity and validity on 10 randomly selected street food vendors in open air market area in Atbara. Results of the pre-test were used in the revision of the initial survey tool. The final version of the survey tool contained 26 questions

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Table 1. Street foods vended within Atbara city ($n = 50$)

Type	Frequency	%
Cooked vegetable, soup, sauces, meat, chicken, fish. etc	31	41.8
Porridge	12	16.2
Bean (foul)	1	6.8
Snacks	5	11.2
Bottled drink	4	5.4
juice	9	12.2
Roasted groundnut	4	5.4

which were used to collect data from 50 street vendors on their socio-economic, health and personal hygiene knowledge of vendors (hand washing, bathing, food handling and related ailments); and food hygiene and knowledge of food borne illness.

A total of 50 samples of food on sale (30 g) were collected and placed in separate sterile containers and sent to the laboratory on ice container for bacteriological examination.

Pieces of each food weighing 10 g were diluted in 90 ml of phosphate-buffered saline (1:10). All samples were cultured in nutrient broth, blood and Maconkey's agars, (Barrow and Feltham, 1993). Biochemical testes were conducted for identification of the isolates. The total viable counts (TVCs) of the isolated micro-organisms was carried out according to the method of Miles and Misra (1938).

Statistical analysis

The data were analyzed with SPSS software (Statistical Package for the Social Sciences, version 11.5, SSPS Inc and Chicago, IL, USA). Frequencies as well as the percentages of responses in each category were computed and all TVCs bacteria were converted to \log_{10} CFU cm^{-2} for analysis and ANOVA was performed Cross-tabulation and the χ^2 test were used to examine the relationships among and between the variables. Statistical significance was set at a P value of < 0.05 .

RESULTS

The street food vended in Atbara city were cooked meals (41.8%), juice (12.2%) and bottled drink (5.4%), in addition to other categories (Table 1). It was shown that health and hygienic practice of the street vendors surveyed in Table 2. The respondents that agreed the hand must be washed after eating meal (98%) or when handkerchief was used (74%) or even when touching money or during continuous food handling (62%). Also they were decided that the vendors should be prevented from cooking and vending if they were sick (94.0%). Table 3 summarized the knowledge of food handling and 56% of the vendors were cooked the food during selling but 38.0 % of them reheated the sold food or make adequate cooking.

Details of knowledge exhibited by respondents on food borne diseases were shown in Table 4. The most common contaminants of the food were splinters of wood and shards of glasses (46.0%) and food colouring, flavoring and spices (34.0%). The isolated bacteria from cooked

meals, bottled drink and juice were *Escherichia coli*, *Staphylococcus aureus* and *Bacillus* sp. (Table 5). The viable counts in cooked vegetables was 4.6, bottled drink and juice was 3.7 and 4.1 \log_{10} (CFU/ml) respectively.

DISCUSSION

The present survey reveals the knowledge and practices of street food vendors in Atbara city. Socio-economic and demographic data showed that most of the food vendors were females, although, it is not certain whether the predominance of women in the street food vending trade is advantageous to food safety (Umoh and Odoba, 1999; Mensah et al., 2002; Idowa and Rowland, 2006). The hands are the most important vehicles for the transfer of organisms from faeces, nose, skin, or other sites to food (WHO, 1989). In this study, the vendors studied agreed that the hand must be washed (74.0%), because the organisms such as *Salmonella typhi*, non-typhi *salmonella*, *Compylobacter* spp. and *E. coli* can survive on fingers tips and other surfaces for varying periods of time and some cases after hand washing (Pether and Gilbert, 1971; WHO, 1989). Also clean water supply and hand washing or toilet facilities are not available to food street vendors and this in agreement with the findings of Bryan et al. (1988) and Abdalla et al. (2008a). All these findings are in disagreement with requirements for effective hand washing of WHO (1984).

The health and personal hygiene knowledge in this survey showed that the majority of the vendors must be done and should not only be triggered by evidences of visible dirt or objectionable body odour (WHO, 1996; Abdalla et al., 2008a). Adequate temperature in cooking and storage of foods is important to minimize the growth of bacteria (Table 5) and the food that cannot maintain within the safety temperature zone may act as incubator for pathogenic bacteria whether the food is raw, partially cooked or fully done (Roller, 1999; Abdalla et al., 2008b).

The isolation of the pathogenic organisms from vended food (Table 5) that to ensure the food involved in transmission of pathogenic bacteria. Similarly, pathogenic organisms such as Hepatitis A, faecal coliform and *S. aureus* were isolated from food (Roller, 1999; Bryan et al., 2003).

Table 2. Health and personal hygiene practices of street food vendors in Atbara city (n = 50).

Topics	No. of positive responses	%
1. Ailments that temporarily prevented vendors from vending or cooking foods		
Cough and colds	47	94.0
Diarrhea	47	94
Nausea	47	94.0
Vomiting	47	94
Sore eyes	47	94.0
Stomach cramps	46	92
Sick member of family	40	80.0
2. Hand washing requirements		
Clean water	48	96.0
Soap	42	84.0
Clean hand towel	32	64.0
Disinfecting solution	1	2.0
3. Reasons for hand washing		
Touching money	25	50
Handling garbage	42	84.0
Blowing of nose	35	70.0
After eating meals	49	98.0
After using the toilets	46	92.0
Handling raw foods	19	38.0
Scratching	10	20.0
Continuous food handling	23	46.0

Table 3. Food-handling practices of street food vendors in Atbara (n = 50).

Parameter	n	%
1. Parameters considered in buying food to be cooked or vended		
Price	31	62.0
Freshness	29	58.0
Volume	34	66.0
Sold by reputable manufacturer/wholesaler	14	28.0
2. Food handling practices		
Food cooked during sale	28	56.0
Food cooked on morning of sale	4	8.0
Food sold from tray with covering	11	22.0
Food sold from tray with no covering	19	38.0
Food handled at ground level	19	38.0
Food exposed to flies	47	94.0
Food reheated before sale	19	38.0
Adequate cooking of food	19	38.0
Thorough washing of food to be cooked	17	34.0
Use of safe water for cooking	3	6.0
3. Serving of food		
Food served with fork/spoon	0	0
Food served with bare hands	30	60.0
Food served into cup/plate	33	66.0
4. Left-over food management used		
Throw away	15	30.0

Table 2. contd.

Eaten at home	11	22.0
Refrigerated and reheated	1	2.0
No answer/no left-over	8	16
5. Source of water for hand washing and cooking		
Tap	30	60
well	22	44
6. Methods used in cleaning utensils		
Washing with soap and water	39	78.0
Washing with hot water	4	8.0
Drying with cloths	23	46.0

n = Number of positive response.

Table 4. Knowledge of Food contamination and Symptoms by Street food vendors in Atbara ($n = 50$)

Topics	n	%
1. Familiarity with the term food - borne illness	15	30
2. Types of food contaminants include		
worms and parasites	3	6
splinters of wood and shards of glass	23	46.0
invisible germs in foods	5	10.0
Kerosene oil, detergent, or other similar products	14	28.0
Food colouring, flavouring and spices	17	34.0
Insects, insect droppings and dirt	28	56.0
3. Symptoms of food borne illness...		
Stomach pain	43	86.0
Diarrhoea	42	84.0
Vomiting	39	78.0
Nausea	34	68.0
Headache	6	12.0
4. Types of food borne illness		
Typhoid. . . from contaminated water	18	36.0
Cholera from contaminated water	37	74.0
Dysenteryfrom contaminated food and water	30	60.0

n = Number of positive response.

Table 5. Mean and standard deviation level of Total Viable Count of bacterial detected in street food in Atbara city.

Food item	Mean log ₁₀ CFU/g (ml) ± S.D				
	Number	TVC	<i>E. coli</i>	<i>S. auerus</i>	<i>Bacillus sp.</i>
Cooked vegetable, soup, sauces, meat, chicken, fish etc.	30	4.6	3.2 ± 0.21	3.1 ± 0.25	2.3 ± 0.23
Porridge	10	3.8	2.3 ± 0.23	3.1 ± 0.21	3.2 ± 0.21
Bean (Foul)	12	4.2	3.1 ± 0.25	3.2 ± 0.21	3.2 ± 0.21
Snacks	14	3.3	3.4 ± 0.21	3.2 ± 0.21	3.2 ± 0.23
Bottled drink	20	3.7	3.4 ± 0.21	3.6 ± 0.33	2.3 ± 0.23
juice	20	4.1	3.1 ± 0.21	3.1 ± 0.21	3.6 ± 0.33
Roasted groundnut	8	4.2	3.2 ± 0.21	3.1 ± 0.21	3.1 ± 0.21

In conclusion, the routine medical examination of food handlers must be carried by health officers in the development of strategic plans towards regulating safe street food handling, preparation and vending.

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