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Food Safety Knowledge among Food Workers in Restaurants of Salalah Municipality in Sultanate of Oman

Magdi Ahmed Ali, Yassir Adam Shuaib, Hatim Hamad Ibrahaem, Siham Elias Suliman, Mohamed Abdelsalam Abdalla*

College of Veterinary Medicine, Sudan University of Science and Technology, P.O. Box: 204, Khartoum North, Sudan

Abstract *—This survey was conducted from June to December 2012 in Salalah Municipality, Sultanate of Oman, to investigate the knowledge of restaurants workers about food safety-related issues. A total of questionnaire-guided interviews with 21restaurant workers and food handlers were carried out. Major food safety knowledge concepts including personal hygiene, prevention of cross contamination, general sanitation, safe storage of food, knowledge of health problems that would affect food safety, knowledge of symptoms of foodborne illnesses, and knowledge of important foodborne pathogens were investigated. The responses of interviewed workers varied considerably. In general, the workers had good knowledge about some food safety-related issues and not enough knowledge about other issues. Although the results of the questionnaire showed that the majorityof the food workers and handlers know the importance of washing hands before work and proper cleaning and handing of instruments and kitchen utensils and their role in reducing the risk of food contamination, in addition to their knowledge that eating and drinking at the work place increases the risk of food contamination, its observed that these workers do not practice that as a part of their routine work. Therefore, training programs are warranted together with continuous monitoring of the workers' behavior and practices.*

Keywords— Food safety, knowledge, food workers, restaurants, Oman.

I. INTRODUCTION

Food and water-borne diseases are widespread in many countries, especially the developing ones. Epidemiological studies have shown that a great proportion of these diseases occur as result of poor food sanitation and unhygienic handling of foods in restaurants and other eating outlets (Antoria, 2002).Food safety concerns are magnified when an outlet prepares foods from raw materials, since food service workers and personnel have a major responsibility concerning the safety of the food andtheir actions can affect the health of many people (Byran, 1992). Types of foods that are mostly involved in outbreaks of food-borne diseases include milk and milk products, vegetables, salads and puddings, and meat and meat products (WHO, 2005). Introduction of a HACCP system would improve and reduce the incidence of food poisoning in restaurants and hence facilitate inspection and quality assurance follow up by regulatory authorities. Additionally, introduction of HACCP system may promote international trade by increasing confidence in food safety and provide a more specific and critical approach to the control microbiological hazards in foods than that provided by traditional inspection and quality control approaches (Amref, 1982).

Food safety is very important for restaurants (WHO, 2005). Once a restaurant is implicated in a food-borne illness,it can result in damaging of its publicity, consumer interest and trust loss, as well as community health regulation and legal charges (Seward *et al.*, 2003). Considering the significance of food safety, it is astonishing how there are few studies that examine the awareness of workersof food safety at restaurants. Even though food safety complications can arise during any part of food production, restaurants are a crucial final step in the series "from the farm to fork" (Seward *et al.*, 2003). This study attempted to establish whether the workers of the restaurants of Salalah Municipality in Sultanate of Oman have good (enough) knowledge about food safety-related issues or not.

II. MATERIALS AND METHODS

Study design and sampling strategy

This surveywas conducted from June to December 2012 in Salalah Municipality, Sultanate of Oman. A total number of 21 restaurants were selected from 7 different areas, namely Al-Haafah, Al-Sinaat Al-Jadeedah, Al-Goof, Awgaad, Al-Saadah North and South, and Salalal Al-Wustaa. Three

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restaurants were selected and investigated in each area (Thrusfield, 2007).

Respondents and food safety knowledge questionnaire

A total of 21restaurant workers and food handlers participated in the study. They were selected based on their willingness to take part in the study.

The questionnaire consisted of many questions testing major food safety knowledge concepts including personal hygiene, prevention of cross contamination, general sanitation, safe storage of food and food materials, knowledge of health problems that may affect food safety, knowledge of symptoms of foodborne illnesses and knowledge of important foodborne pathogens. All questions were adapted from published literature(Osaili*et al.*, 2013). To reduce the possibility of selecting the correct answer by chance, all questions have the option "do not know". The questionnaire took about 15 minutes to complete and it was pilot tested.

Data Management and Statistical Analyses

All collected data were entered, coded, and stored electronically in a Microsoft® Excel for Windows® 2007 data base. The Statistical Package for Social Sciences (SPSS) for Windows® version 18.0 (SPSS Inc., Chicago, Illinois) was used for all appropriate statistical analyses. Descriptive statistics; frequencies and proportions were obtained.

III. RESULTS

All the respondents (n=21, 100%) were sure that washing hands before starting food preparation, using gloves during food preparation as well as proper cleaning and handing of food preparation instruments reduce the risk of food contamination. Moreover, all of them (n=21, 100%) were once again sure that eating and drinking at the work place increase the risk of food contamination. The majority of respondents (n=18, 85.8%) indicated that individauls, including children, adults, pregnant women, and elderly are not at equal risk for food poisoning (Table 1).

Table.1: Responses of the Restaurants Workers in Salalah Municipality regarding Risk of Food Contamination and Food Poisoning (From June to December/2012)

Statement	A	%	B	%	C	%
Washing hands reduces risk	21	100	0	0.0	0	0.0
Wearing gloves reduces risk	21	100	0	0.0	0	0.0
Cleaning instruments reduces risk	21	100	0	0.0	0	0.0
Eatingat work place increases risk	21	100	0	0.0	0	0.0
All persons are at risk for food poisoning	03	14.2	18	85.8	0	0.0

A=True, B=false, C=do not know

All of the respondents (n=21, 100%) were sure diarrhea is transmitted by food and Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) is not. While opinions regarding other diseases such as typhoid, jaundice, brucellosis and bloody diarrhea were divided between it is true these diseases are transmitted by food and false (Table 2).

Table.2: Responses of the Restaurants Workers in Salalah Municipality regarding Infectious Diseases that can be Transmitted by Food (From June to December/2012)

Diseases Transmitted by Food	A	%	B	%	C	%
Typhoid	11	52.3	10	47.7	0	0.0
Jaundice	08	38	13	62	0	0.0
Diarrhea	21	100	0	0.0	0	0.0
HIV/AIDS	00	0	21	100	0	0.0
Brucellosis	09	42.8	12	57.2	0	0.0
Bloody diarrhea	19	90.4	02	9.6	0	0.0

A=True, B=false, C=do not know

All of the respondents (n=21, 100%) did not have doubt that *Salmonella* species, *Staphylococcus* species, *Clostridium* species and Hepatitis A and B viruses are for sure among the bacterial and viral food-borne pathogens (Table 3).

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Table.3: Responses of the Restaurants Workers in Salalah Municipality regarding Food-borne Pathogens (From June to December/2012)

Food-borne Pathogens	A	%	B	%	C	%
Salmonella species	12	57.2	9	42.8	0	0.0
Hepatitis A virus	11	52.3	10	49.7	0	0.0
Hepatitis B virus	0	0.0	21	100	0	0.0
Staphylococcus species	11	52.3	10	49.7	0	0.0
Clostridium species	15	71.4	6	28.6	0	0.0

A=True, B=false, C=do not know

Regarding skin and eye infections, all the respondents (n=21, 100%) thinkit is very necessary to take a leave from work. Moreover, the majority (n=17, 100%) think for sure abortion is a food-borne disease. While, 90.5% (n=19) of the respondents do not know the correct temperature of the refrigerator is 4 ºC (Table 4).

Table.4: Responses of the Restaurants Workers in Salalah Municipality regarding Sicknesses and Food Storage(From June to December/2012)

Infectious disease	A	%	B	%	C	%
Refrigerator temp is 4 ºC	02	9.5	19	90.5	0	0.0
Infectious disease of skin	21	100	0	0.0	0	0.0
Infectious disease of eye	21	100	0	0.0	0	0.0
Abortion is food-borne disease	04	19.0	17	81.0	0	0.0

A=True, B=false, C=do not know

To ensure the reduction of micro-organisms to the least possible number in the served food the following food-safety measures: washing of hands, wearing gloves, an apron, and caps are thought to be very important by all (n=21, 100%) of the respondents and these are responsibilities of the food handlers. Moreover, a food handler who has an abrasion or a cut on hands should not touch foods without gloves. Raw and cooked foods should be stored separately, food hygiene training for workers, checking the temperature of the refrigerator periodically and evaluation of the health status of the workers before employing are other important food-safety measures. When these measures are applied, the risk of food contamination will be reduced as claimed and perceived by the respondents (Table 5). Also, 100% (n=21) of the respondents were certain that food-borne illnesses can have deleterious health and economic effect on the society. Eighteen (85.7%) of the respondents indicated that wearing masks will likely lead to the reductions of microbes in the served food while and 3 (14.3%) had an opposing opinion (Table 5).

Table.5: Responses of the Restaurants Workers in Salalah Municipality regarding Food Safety Measures that will Result in Reduction of Contaminants in the Served Food(From June to December/2012)

Food Safety Measures	A	%	B	%	C	%
Washing hands	21	100	0	0.0	0	0.0
Wearing gloves	21	100	0	0.0	0	0.0
Wearing apron	21	100	0	0.0	0	0.0
Wearing masks	18	85.7	3	14.3	0	0.0
Wearing caps	21	100	0	0.0	0	0.0
Cuts must wear gloves	21	100	0	0.0	0	0.0
Raw & cooked foods stored separately	21	100	0	0.0	0	0.0
Training of workers	21	100	0	0.0	0	0.0
Check fridge temp	21	100	0	0.0	0	0.0
Evaluation of thehealth status of workers	21	100	0	0.0	0	0.0

A=True, B=false, C=do not know

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The respondents were asked if they wear gloves when working, wash hands before wearing the gloves, wear an apron and a mask and wear a cap when working, wash hands before and after touching raw meat, wash hands after the rest time when coming back to work, eat and/or drink and if they smoke at the work place. They were also asked how often do they use the products of their working restaurants and how often do they recommend the products of your working restaurants to others. Responses to these questions differed a little bit but the answer "never" had the vast majority frequencies (Table 6).

Table.6: Responses of the Restaurants Workers in Salalah Municipality regarding their General Behaviors (From June to December/2012)

Do you?	Always	Often	Sometimes	Rarely	Never
wear gloves	0 (0.0)	0 (0.0)	11 (52.4)	0 (0.0)	10 (47.6)
wash hands before gloves	0 (0.0)	0 (0.0)	1 (4.8)	0 (0.0)	20 (95.2)
wear apron	0 (0.0)	0 (0.0)	1 (4.8)	0 (0.0)	20 (95.2)
wear mask	14 (66.7)	0 (0.0)	5 (23.8)	0 (0.0)	2 (9.5)
put on cap	1 (4.8)	0 (0.0)	4 (19.0)	0 (0.0)	16 (76.2)
wash hands before touch meat	1 (4.8)	0 (0.0)	0 (0.0)	0 (0.0)	20 (95.2)
wash hands after touch meat	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	21 (100)
wash hands after rest	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	21 (100)
ingest at work place	20 (95.2)	1 (4.8)	0 (0.0)	0 (0.0)	0 (0.0)
smoke at work place	21 (100)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
use products of your plant	1 (4.8)	0 (0.0)	0 (0.0)	0 (0.0)	20 (95.2)
advise products to others	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	21 (100)

IV. DISCUSSION

In the present study all of the respondents were sure that washing hands before starting food preparation and wearing gloves during food preparation decrease the risk of food contamination. These findings resembled the results of Ko (2011) and Rosnani et al. (2014). Ko (2011) found out that the vast majority of the restaurants employees of Fu-Jen University in China believe that hands washing before touching food and wearing disinfected water proof gloves for processing uncooked foods can decrease the risk of contamination. While Rosnani*et al.* (2014) pointed out to that touching food which was not wrapped up with bare hands is a bad practice with an average score of 78.9±25.611 as thought by restaurant workers in Putrajaya, Malaysia. In food workers-associated foodborne outbreaks, the most frequently reported route of transmission involved poor hand hygiene or bare hand contact with food (Todd *et al.*, 2007). Azanza and Zamora-Luna (2005) found that the knowledge and application of the basic principles of the hygiene like washing hands during preparation of food and serving it has led to a significant reduction in the level of microbial contamination in Philippines. Van-Campen (1998) found out that lack of hand washers and the low level of the peoples' knowledge led to the preparation of unhealthy and risky food in Jakarta. Furthermore, 33.4% of the samples collected from the hands of the food workers were having a higher level of bacterial contaminants than the recommended level (Van-Campen, 1998). Previous epidemiological studies have shown that *E. coli*, *Salmonella* species and *Staphylococcus aureus* can survive on the hands for a certain period of time if the hands were not washed or even sometimes when washed, thus wearing gloves during food preparation is advisable to significantly reduce the food contamination (Pether and Gilbert, 1971; WHO, 1989). In agreement with the findings ofBas et al. (2006), Santos (2008) and Sani (2011),it has been noticed in this study that food workers and handlers have a firm knowledge on the hygienic measures to prepare safe food. The most important hygienic measure is cleaning of the working environment. However, all of the respondents were sure that proper cleaning and handing of food preparation instruments reduce the risk of food contamination. This was different from the findings of Ko (2011) who observed that only equal or less than four point scales in response to the following questions: I did not need to clean the drainage each day, when I washed the dishes I would use the three sinks method, and if there were cracks on the dishes I would still use them. Most of the respondents did not know that all individuals in a community, including: children, adults, pregnant women and elderly are at equal risk for food poisoning. Latif *et al*., (2014) who found only one half (n =

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15) of the respondents think all individuals in a community are at the same risk of food poisoning.

All of the respondents thought that diarrhea was with no tiny doubt is transmitted by food HIV/AIDS is not. Perceptions regarding other diseases were divers. This finding showed, somehow, the lack of enough knowledge about the transmission routes of infectious and poisonous agents that can be transmitted by foods. Ko (2011) did report similar findings. This could probably be due to the low education level of the workers and that they do not receive enough trainings.

The respondents had different perceptions regarding the transmission of *Salmonella* species, *Staphylococcus* species, *Clostridium* species and Hepatitis A and B viruses by foods. Ko (2011) found out that the least correctly answered question was that "*Salmonella* is easily contracted from seafood products" with a 28.8% correct rate. However, the findings of this study agreed with the findings of Ko (2011) who found out that most of the restaurant workers were not familiar enough with food poisoning agents and the types of food poisoning.

All the respondents thought it is very necessary to take a leave from work when a worker has an infectious disease of skin or eyes or other illness symptoms. This is in agreement with what Carpenter et al. (2013) who recommended that workers with symptoms of illness, especially food-borne ones, should be excluded from work. Furthermore, Carpenter et al. (2013) observed that 60.0% (n=491) of workers recalled working while ill in 9 different locations in the US and 20.0% of them indicated that they had worked while vomiting or having diarrhea for at least one shift in the year 2012 (Carpenter *et al*., 2013). Hedberg *et al.* (2006) found out that workers did know handling of food by an infected person or a carrier of pathogens contributes in restaurant-related foodborne outbreaks. Carpenter *et al.* (2013) found that most workers' decisions to work or not while ill was influenced by the possibility of spreading illness and this suggested that the food workers were aware of their potential role in the spread of infection. In the current study, the majority of the respondents were sure abortion is not a food-borne disease.

The majority of the respondents do not know the correct temperature of the fridge for storing food. Rosnaniet al. (2014) indicated that 77.2% (n=98) of the respondents agreed that defrosted food should not be refrozen again. Whereas Ko (2011) noted that the least correctly answered question was "freezing had a better sterilizing effect than heating". Leaving ready-to-eat food at room temperature for long time, slow cooling, and improper cooking without were seen to be practiced by manyfood workers. Wrong thawing of frozen red meat, poultry, and fish could result in some food poisoning cases among consumers (Robert, 1982; WHO, 1989 and Abdalla, 2008). Bas (2006), Santos (2008) and Sani (2011) found out that most of the food workers and handlers lack the knowledge on important issues for preparing and serving a safe food like the proper temperature for food storage; only 9.5% of the food workers who were answering the questionnaire knew the right temperature for food storage.

Raw and cooked foods should be stored separately, food hygiene and safety trainings for workers and evaluation of the health status of the workers before employing are generally important foodsafety measures, when applied will result in reducing the risk of food contamination as claimed and perceived by all of the respondents. Also, all of the respondents were certain that foodborne illnesses can have deleterious health and economic effect on the society. The vast majority (n=18) of the respondents think that wearing masks is important in reducing risk of food contamination. However, Rosnani et al. (2014) found out that 80.3% (n=102) were not supporting the suggestion of storing raw and cooked foods separately. Other general food-safety measures stated by Rosnani *et al.* (2014) included workers should not rub hands or face and hair and should not smoke while working and separate kitchen utensils that were used to serve and prepare cooked and raw foods. The findings of this study did confirm the findings of Ko (2011) who found that among the questions that had the highest scores was, "I think raw food and cooked food must be handled separately".

Although the results of the questionnaire showed that all of the food workers and handlers know the importance of washing hands before work and proper cleaning and handing of instruments and kitchen utensils and their role in reducing the risk of food contamination, in addition to their knowledge that eating and drinking at the work place increases the risk of food contamination, its observed that these workers do not practice that as a part of their routine work. This denotes to the need of continuous training and monitoring of the behaviors and practices of restaurants workers.

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