Food safety knowledge, attitudes and practices among food handlers working in meat selling establishments in the City of Nairobi

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Abstract

Introduction: Food-borne diseases have been increasing in recent years with a greater impact on health and economies of developing countries. Good levels of knowledge towards food safety among food handlers and the effective practices in food handling are imperative in reducing such illnesses.

Objective: The aim of the present study was to evaluate the level of knowledge, attitudes and practices in food safety among food handlers working in meat selling and processing points within Nairobi city.

Methodology: A cross-sectional study was conducted in the City of Nairobi. Data were collected from 100 food handlers working in food establishments selling meat in the city using an interviewer administered questionnaire.

Results: Majority of the participants were male (80.0%) and Christians (89.0%). The median (interquartile range (IQR)) age of the participants was 30.5 (26.0-38.0) years. The respondents demonstrated above average proficiency in the assessments involving Knowledge, Attitudes and Practices (KAP). The overall KAP scores were not associated with age, gender, level of education and marital status. On the other hand, respondents who had ever attended a food handling and/or food safety course had a statistically significantly higher KAP mean score than their counterparts who had never attended (respectively, 31.5 ± 0.2 versus 30.3 ± 0.3 , $p=0.003$).

Conclusion: The level of knowledge, attitude, and practice on food safety and food handling amongst the sampled food handlers were found to be favorable. Training, motivation and initiatives should be provided to encourage food handlers to sustain this positive trend in knowledge, attitude, and practices in food safety.

Key words: Knowledge, Attitudes, Practices, Food handlers, Safety

Introduction

Diseases spread through food still remains a common and persistent public

health problem in developing countries resulting in appreciable morbidity and mortality. According to the World Health Organization (WHO), up to 2 million deaths attributable to food-borne illnesses occur in developing countries per year [1]. Food handlers play an important role in ensuring food safety throughout the chain of production, processing, storage and preparation [2]. A systematic review conducted by Todd *et al* [3] classified the factors contributing to outbreaks into; food worker error factors, bacterial proliferation factors, and important survival factors for pathogens. It is estimated 25% of the reported outbreaks can be avoided by safe food handling practices [4]. Education of food industry personnel in hygiene matters has also been recommended as a means of improving food handling practices and thus the safety of food. Documenting the levels of knowledge on food safety among the food handlers as well as their attitude and practices will pinpoint areas that require strengthening or attention in the training programme with regard to ensuring the safety of foods. The current study aimed at obtaining information on the food safety knowledge, attitudes and practices of the food handlers in the City of Nairobi. Information gathered from this study could be used by county government in strengthening current strategies aimed at enhancing safety of foods sold in various meat-eating outlets in the city.

Materials and Methods

Study design: This was a descriptive simple randomized cross sectional study.

Study site: The study was conducted in selected butcherries and a meat processing factory within Nairobi city of Kenya which has an estimated population of 3.1 million residents [5].

Study population: The study subjects comprised of food handlers working in registered food establishments selling and processing meat and meat products in the City of Nairobi.

Data collection procedure: Pre-tested structured questionnaires were used to interview food handlers from the sampled meat processing and selling establishments. Information on demographics, food safety knowledge, attitudes and practice was collected.

Sample size and sampling approach: Computation of the sample size was done using Epi info™ 7.1.3 (Centers for Disease Control and Prevention (CDC), Atlanta). The indices used to compute the sample size were: confidence level (95%), an error margin (10%), a power (80%) and a fifty percent frequency of a 50-50 chance of appropriate knowledge, attitude and practice of food hygiene by food handlers. Assuming 5% non-responses, the sample size for the study was determined to be a hundred respondents. Five food establishments were selected randomly from a list of registered meat selling premises for inclusion in the study. The number of food handlers interviewed per establishment and by category were allocated using probability proportional to size approach. Individual participants were selected randomly using a lottery method.

Data management and analysis: Data collected were entered using Microsoft Excel® and imported to IBM SPSS Statistics® 21.0 (IBM Corporation, New York) for statistical analyses. Analyses involved computation of appropriate descriptive statistics. Association between the variables was assessed by use of chi square (χ^2) tests. Anova and independent t tests were used to test difference between means of various groups of respondents. The threshold for statistical significance will be set at $p < 0.05$.

Ethical issues: Ethical clearance to conduct the study was obtained from the Ethical Review Committee of Kenyatta University. Informed consent was obtained from all the study participants.

Results

Description of the respondents: One hundred respondents were enrolled in the current study majority being male (80.0%) and Christians (89.0%). Their median (interquartile range (IQR)) age was 30.5 (26.0-38.0). Analysis of the respondents' education showed that 36% and 34% of the sampled food handlers had attained secondary and post-secondary levels of education respectively. Five respondents (5.0%) had no formal education. In terms of experience, most of the respondents (74.0%) had worked for at least one year. Sixty four participants (64%) had received some form of training on food handling and/or food safety.

Assessment of knowledge: The study participants were subjected to a set of fifteen questions aimed at assessing their knowledge on various facets of hygiene and food handling. For every question the respondent answered correctly a score was awarded or else none. Table 1 shows the item wise variation of the scores on knowledge. All respondents knew that hands should be washed before handling food and after visiting the bathroom. Additionally, an overwhelming majority of the respondents knew that insects such as cockroaches and flies might transmit food borne pathogens and raw (97.0%) and cooked meat should be kept separately (97.0%). In each case 95 (95.0%) food

handlers responded correctly to the following questions; 'Eating raw or half -cooked meat is highly risky for food poisoning?', 'Harmful bacteria multiply quickly at room temperature?' and 'Vegetables should be placed on higher shelf in a refrigerator than meat?'. Sixty one percent of the respondents were aware that apparently healthy food handlers might carry food borne pathogens. Further, 24 food handlers (24.0%) were unaware that food poisoning could cause severe diseases that may result in hospitalization and sometimes death. An equal proportion of respondents were not aware that the habit of fingering the nose raises the risk of causing food poisoning.

Table 1: Responses to knowledge items

No.	Attribute	Frequency (n=100)	(%)
1	Hands should be washed before handling food and after visiting the bathroom	100	100.0
2	Food poisoning could cause severe diseases that end in hospitalization and sometimes death	76	76.0
3	Apparently healthy food handlers might carry food borne pathogens	61	61.0
4	Eating raw or half -cooked meat is highly risky for food poisoning	95	95.0
5	The habit of fingering the nose raises the risk to cause food poisoning	76	76.0
6	Food handlers with unhygienic practice could be the source for food contamination with food poisoning pathogens	94	94.0
7	Eating covered leftover cooked food, kept at room temperature for more than 6 hours, is at high risk to cause food poisoning	85	85.0
8	Keeping food at refrigerator temperature helps to prevent food poisoning	91	91.0
9	Contacting ready to eat food with bare hands cause food contamination with food poisoning pathogens	85	85.0
10	Skin infections can contaminate food	87	87.0
11	The correct method for thawing frozen meat is to keep them overnight at room temperature	81	81.0
12	Insects such as cockroaches and flies might transmit food borne pathogens	99	99.0
13	Harmful bacteria multiply quickly at room temperature	95	95.0
14	Vegetables should be placed on higher shelf in refrigerator than meat	95	95.0
15	Raw and cooked meat should be kept separately	97	97.0

n = Number of respondents

Assessment of attitudes: Table 2 presents the findings on the assessment of the attitude of the food handlers. Majority of the study participants (86.7%) either disagreed or strongly disagreed with the statement; ‘Food borne outbreaks are natural life event’. The surveyed food handlers had a favourable attitude towards training on food handling and food safety with most of them (88.0%) agreeing or strongly agreeing to the statement that; ‘Learning more about food safety through training courses is important to me’. Furthermore, most respondents (92.9%) were willing to change their food handling behaviors on realization that it was hazardous to the health of the customers and/or themselves. Only 13% of the food handlers agreed or strongly agreed that food borne outbreaks are natural life events. All the respondents were in strong agreement or agreed with the fact that sanitation and safe food handling were important part of their job responsibilities. An equal proportion agreed or strongly agreed that it was their responsibility as a food handler to ensure that meat they sold was safe. Majority of the respondents (90%) either agreed or strongly agreed that being medically examined every six months was crucial in promoting a food handler’s health and that of the customers. Further, 93% and 97% of the food handlers, respectively, either agreed or strongly agreed that they were willing to change their food handling behaviors on realization that what they were doing was incorrect and that sanitation and adequate employee hygiene can prevent food borne illness.

Table 2: Assessment of the attitude of the study participants

No.	Attribute	No.	Yes (%)	No. (%)
1	Food borne outbreaks are natural life events	98	13.3	86.7
2	Learning more about food safety through training courses is important to me	100	88.0	12.0
3	I am willing to change my food handling behaviors when I know they are incorrect	99	92.9	7.1
4	Sanitation and safe food handling are an important part of my job responsibilities	100	100.0	0.0
5	It is important to regularly check the temperature of the refrigerator	99	89.9	10.1
6	I believe that adequate employee hygiene can prevent food borne illness	100	97.0	3.0
7	I believe being medically examined every six months is important for a food handler’s health and that of the customers	98	89.8	10.2
8	I think that it is my responsibility as a food handler to ensure that meat I sell is safe	100	100.0	0.0

No. = Number of respondents

Assessment of practices: The outcomes on evaluation of practices amongst the enrolled food handlers are as shown in Table 3. The practice of washing hands was reportedly highly prevalent with most of the respondents always washing hands with water and soap before handling meat/food (94.0%) and after defecation and/or micturition (90.0%). Moreover, 96.9% of the respondents said they always dried their hands with towel after washing them. Quite a sizeable proportion of respondents admitted to not always trimming their finger nails (13.3%) and not cleaning the meat contact surfaces including the chopping boards always (16.0%). Furthermore, 11.3% reportedly did not always ensure that they had valid medical licenses as they at times fail to go for the biannual medical checkups. Of the food handlers interviewed only 86.9% and 90.0% said that they always ensured that cooked meat was not kept at room temperature for more than 4 hours while only 90.0% always separated raw meat from ready to eat foods (86.9%). All the respondents responded on the negative on inquiring whether they ate raw or half-cooked meat.

Table 3: Assessment of practices of the study participants

No.	Attribute	Frequency	Always	
			No	Yes
1	Wearing protective gear when handling meat	99	10.1	89.9
2	Wash your hands with water and soap before handling meat/food	100	6.0	94.0
3	Wash your hand with water and soap after defecation and/or micturition	100	10.0	90.0
4	Drying hands after washing them with towel	98	3.1	96.9
5	Ensuring you go for a medical checkup every six months	97	11.3	88.7
6	Checking the temperature of the refrigerator regularly	93	8.6	91.4
7	Stop working when you have ‘simple’ ailments, e.g., cold or lesions on your hands	100	21.0	79.0
8	Trimming of finger nails	98	13.3	86.7
9	Ensuring that cooked meat is not kept at room temperature for more than 4 hours	100	10.0	90.0
10	Cleaning of meat contact surfaces including the chopping boards, utensils etc	100	16.0	84.0
11	Separate raw meat from ready to eat foods	99	13.1	86.9
12	Eat raw/half-cooked meat (inside is pink)	100	100.0*	0.0

n = Number of respondents, *All answered never

Overall KAP performance: For every correct response provided a score was awarded, else naught. Based on the 15-item knowledge evaluation assessment, the mean $\pm$ standard deviation (sd) score was 13.0 ± 1.0 . Examinations of the distribution of the ten-item test on attitude showed that scores ranged from five to ten with the mean $\pm$ sd score being 7.4 ± 0.8 . The practice assessment comprised of twelve items and the respondents scored a mean $\pm$ sd of 10.6 ± 1.1 . The maximum possible overall KAP score was 35. The overall KAP mean $\pm$ sd score for the study participants was $31.0 (1.9)$ with the range being 26 and 35 scores.

Association of KAP scores by selected attributes: On conducting the independent t-test, the overall KAP scores was found not to vary significantly by marital status and religion as shown in Table 4. Gender wise comparisons revealed that the mean KAP scores for men and women who were working as food handlers were similar statistically ($p=0.265$). The study participants who had one year of experience as a food handler or more performed slightly better than their counterparts who had less experience as food handlers. However, this did not reach statistical significance ($p=0.544$).

The food handlers who had ever attended a food handling and/or food safety course had a statistically significantly higher KAP mean score than their counterparts who had reported that they had never attended a food handling and/or food safety course (respectively, 31.5 ± 0.2 versus 30.3 ± 0.3 , $p=0.003$). Besides, the overall KAP scores were varied significantly by the type of work the respondent was undertaking ($p=0.011$); processors were statistically significantly more knowledgeable than the sellers (31.5 ± 0.2 against 30.5 ± 0.3 respectively).

Table 4: Variation of KAP scores by selected attributes

Characteristic	Frequency (n=100)	Mean	Std. Error	P-value
Marital status				
Married	69	30.9	0.2	0.939
Single	31	31.4	0.4	
Gender				
Male	80	31.0	0.2	0.265
Female	20	31.0	0.4	
Religion				
Christian	89	31.0	0.2	0.549
Muslim	11	31.4	0.6	
Experience				
> 1 year	26	31.2	0.3	0.544
≥ 1 year	74	31.0	0.2	
Ever attended a food handling and/or safety course				
Yes	64	31.5	0.2	0.003
No	36	30.3	0.3	
Job description				
Processors	56	31.5	0.2	0.011
Sellers	44	30.5	0.3	

Analysis of variance (ANOVA) of the overall KAP scores by age and education was also performed and the results are presented in Table 5. There was a decline in performance with age with the performance of food handlers aged above 35 years being the lowest. Nevertheless these variations by age were not statistically significant ($p=0.304$). Similarly, overall KAP performance seemed to improve along with the level of education though not significant ($p=0.241$).

Table 5: Variation of KAP scores by selected attributes

Characteristic	Frequency (n=100)	Mean	Std. Error	P-value
Age category (years)				
≤ 25	20	31.4	0.4	0.304
26-35	46	31.2	0.3	
>35	34	30.6	0.3	
Education				
No formal education/Primary	5	29.6	0.9	0.241
Secondary	61	31.1	0.2	
Post-secondary	34	31.2	0.4	

Discussion

The findings from the present study indicated a high level of knowledge, attitudes and practices among the food handlers. Majority of the sampled food handlers were men. The results corroborates with a study by Kasturwar and Shafee [6] where majority of respondents (62.7%) were male. In contrast with these studies, some studies have reported a higher proportion of females [7, 8]. The difference in proportions could be attributed to the fact that the present study concentrated on food establishments dealing with animal products including butcherries thus a preference for males.

Knowledge: Overall, the food handlers' knowledge was high. This is in contrast with a survey that was performed in small and micro enterprises in South Africa, to assess food handlers' knowledge on food hygiene and the average percentage of correct answers was 46.0% [8]. In another study conducted in Ankara, Turkey, the mean food safety knowledge score of food handlers ($n = 764$) was $43.4\% \pm 16.3\%$ [9]. The food handlers expressed excellent knowledge in all the categories including high risk foods, food borne diseases, food storage temperatures, and sources of food contamination. Nevertheless, lower level of knowledge was demonstrated on enquiring about the proper method of thawing frozen food, where 81% of the food handlers reported that the correct method for thawing frozen meat is to keep them over- night at room temperature. Keeping meat and poultry cold while it is defrosting is essential to prevent the growth of harmful bacteria. There is greater danger of bacterial growth and food spoilage for food thawed at room temperature, hence the best way to safely thaw meat is in the refrigerator. The microwave can also be used to defrost meat more rapidly. Food may also be thawed in cold water in a sink

or container and this must be clean [10]. The present study is in concordance with a survey done in Accra, Ghana [11]. On posing the same question to the food handlers they found that 90% of the food handlers thought that the correct method for thawing frozen meat and broiler is to keep them overnight at room temperature. A substantial proportion of the respondents (39%) did not know that apparently healthy food handlers might carry food borne pathogens.

Practice: The food handlers' practice towards food safety and handling was high. A study done in Jordan found even higher scores in attitudes than the current study. The high mean score of food handlers in the latter study could be explained by the differences in the study settings. The survey done in Jordan was conducted in a military hospital and the obeying the orders attitude of military workers could explain the discordance in the results between the two studies [12]. Indeed, the study reported significant differences in the mean percentage between the military and the civilian food handlers with the civilian score being significantly lower than those of the military food handlers.

The practice of washing hands was reportedly highly prevalent. Majority of the respondents always washed hands with water and soap before handling meat/food (94%) and after defecation and/or micturition (90%). Additionally, 97% of the respondents always dried their hands with a towel following hand washing. On the contrary, other studies showed that the extensive knowledge of the correct practices for hand hygiene do not necessarily translate into practice. For instance an observation study carried out by Green *et al* [13] showed that workers removed their gloves, if worn, placed their hands under running water, used soap, and dried their hands with paper or cloth towels (i.e., appropriate hand washing) in 27% of work activities. The discrepancy could be as a result of barriers in the workplace which may include time pressures and/or lack of staff, as well as structural factors, such as facilities and accessibility to supplies such as soap and towel.

Our study observed regular cleaning of meat contact surfaces, including the chopping boards and utensils was reportedly regularly done by 84% of the sampled food handlers. This is crucial step in the food establishments as it drastically reduced the risk cross contamination of food. A vast majority of the food handlers sampled from the military hospitals (99%) in Jordan practiced proper cleaning and disinfecting procedure of premises, surfaces and utensils. Again, this could be attributed to the high levels of discipline associated with the disciplined forces. In discordance with present study, a survey carried out in Ireland showed that 21.5% of all the chefs interviewed opined that the use of disinfectants in sanitizing worktops is not an essential step [14]. Ready-to-eat foods must never be prepared using a chopping board or knife, that have been used to prepare raw meat, unless they have been washed thoroughly first [15]. In line with this, a substantial proportion of the food handlers interviewed

(87%) said that they always ensured that they separated raw meat from ready to eat foods.

Enquiries on the storage position of a vegetable salad with respect to meat, most of the study participants (95%) knew the vegetables were to be placed on the higher shelf in a refrigerator than meat. This ensures that contamination does not arise from the drips of the meat. An almost similar proportion (92%) was reported in a study conducted in the United States of America (USA) by the Environmental Health Specialists Network (EHS-Net), a network of environmental health specialists focused on the investigation of contributing factors to food borne illness, including food preparation practices and hand washing practices [13]. On the other hand, research involving food handlers working in food businesses in Accra, Ghana, found that 23.8% of the respondents reported that they would place the salad and the meat side by side. Besides, 4.8% were not certain where to place the vegetable salad [12].

A sizeable proportion of the respondents (21%) reported not stopping working when they had 'simple' illnesses such as cold or lesions on their hands. A hand-to-mouth existence prevails for most food handlers, their families, and the greater consideration to loss of income if they do stop working may perhaps override the effect of knowledge. Additionally, some food handlers who consciously overlook the safety risks associated with food handling during cases of ailments may perhaps believe that the risks are outweighed by their culinary prowess or that they have sufficient knowledge and experience with foods to control the degree of risk. These lines of reasoning have been cited by some studies as justifications used by food handlers who were identified as a cause of food borne diseases by asking short cuts in food handling to the detriment of food wholesomeness [16, 17].

Attitudes: The food handlers' attitudes towards food safety were found to be favourable which is in concordance with the findings from a survey by Sharif *et al* [12] where the mean score for the practice assessment was high (90%). The surveyed food handlers had a favourable attitude towards training on food handling and food safety with most of them (88.0%) reporting that learning more about food safety was important to them. Research done in Malaysia reported similar findings among food handlers at a residential college and canteen with a majority of the food handlers (72.3%) stating to have learned more about food hygiene [18]. All the respondents in the current study were of the opinion that it was their responsibility to ensure that the meat they sold was safe. Further, the study reported that only 77% of the food handlers stated safe food handling was an important part of their job responsibilities was imperative for them [18].

Association of KAP scores by selected attributes: In the present study, the overall KAP scores did not significantly differ among the various categories of marital status and religion. The overall mean KAP scores for men and women were similar statistically ($p=0.265$). This is in

discordance with a survey done in hospitals in Jordan where females had a higher mean KAP percentage score as compared to their male counterparts [13]. Moreover, a recent study by Sanlier and Konaklioglu [19] found a statistically significant difference between male and female participants on the overall KAP scores.

The study participants who had one year of experience as food handlers or more performed slightly better than their counterparts who had less experience as food handlers. However, this did not reach statistical significance ($p=0.544$). Though there was an upward trend in the overall KAP scores by levels of education these association of education and overall KAP scores was not significant. Conversely, a survey involving military hospital food handlers, the overall KAP scores were significantly ($P < 0.05$) affected by the levels of education, where the average scores increased with the education level [13]. No statistically significant difference was found between participants of different experience levels just like in the study by Green *et al* [13]. Another study by sharif [12] also found that the educational level of respondents did not influence respondents' knowledge and practice of food hygiene. Age was not significantly associated with the overall KAP scores. The overall KAP scores varied significantly by the type of work the respondent was undertaking ($p=0.011$); meat processors were statistically significantly more knowledgeable than the respondents who were involved in serving the meat to the customers (sellers). The food handlers who had ever attended a food handling and /or food safety course had a statistically significantly higher KAP mean score than their counterparts who had reported that they had never attended a food handling and/or food safety course. This adds to the evidence on the positive impact of education on food safety.

Conclusions and Recommendations

This investigation provides valuable information about the level of knowledge, attitude, and practice in food safety of food handlers working in meat selling establishments in the City of Nairobi. Generally, it was observed that respondents had a satisfactory level of knowledge of food safety as well as a favourable attitude. Majority of the respondents exhibited above average practices in handling of foods, which is commendable. Training, motivation and initiatives should be provided to encourage food handlers to sustain this positive trend.

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Conflict of interest statement

No conflict of interest exist between the authors or institutions with other third parties

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