



# KNOWLEDGE AND PRACTICE ON FOOD HYGIENE AMONG FOOD HANDLERS OF SELECTED RESTAURANTS IN SYLHET CITY, BANGLADESH

Md. Ariful Islam (RN, MPH)<sup>1</sup>, KMA Shafique(MPH, Mphil)<sup>2</sup>, Md. Tajul Islam (RN, MSN)<sup>3</sup>, Md. Saiful Islam Rajib (RN, MPH)<sup>4</sup>

E-Mail Id: arifulislam3012@gmail.com

<sup>1&4</sup>Senior Staff Nurse, 250 Bedded General Hospital, Jamalpur, Dhaka

<sup>2</sup>Assistant Professor, Department of Public Health, Leading University, Sylhet, Bangladesh

<sup>3</sup>Senior Staff Nurse, Coxsbazar Medical College Hospital, Coxs Bazar, Bangladesh

**Abstract:** Food hygiene practices among food handlers has gained noticeable importance in each step of the food chain from the production to preparation and serving of the food in developed and developing countries including Bangladesh. The chances of food contamination largely depend on the knowledge of food handlers and on their food hygiene practices. This study conducted to determine food hygiene knowledge and practice among food handlers. This is a cross sectional descriptive study carried out on 84 food handlers at five selected middle class restaurants Sylhet, Bangladesh. All cleaner, waiter and cooker were included in this study. Demographic data, knowledge and practice of food handlers were analyzed. The total number of food handlers during the study period showed that most of the food handlers (50%) were the age range of 10- 20 years of which majority 81.0% were male and 49% had only primary level of education. Food hygiene practices elaborated significant differences observed by age, gender, education and occupational status. Most of the food handlers had basic knowledge on hand washing  $m \pm sd = 2.77 \pm .546$  and 86.9% had the knowledge on sources of food contamination,  $m \pm sd = 2.83 \pm .461$ . Respondents mostly put the never practice on gloves and mean score is  $2.26 \pm 1.804$ . The out of total respondents in this study had average knowledge  $m \pm sd = 2.15 \pm .668$ , (71.6%) that was significantly associated with age, marital status, occupation and monthly income. The average Food hygiene practices  $m \pm sd = 3.88 \pm 1.059$ , (77.6%) also revealed that there were statistically significant relationship with most of socio demographic variables. Knowledge and practice on food hygiene among food handlers in local restaurants was found good and also a positive association among the variables suggests that the knowledge regarding food hygiene practice is increased by training on measures and its importance in the education of food hygiene which increases knowledge and practice.

**Keywords:** Awareness, knowledge, Personal practice, Wholesome food.

## 1. INTRODUCTION

Food is the suspicious reason for having a number of diseases in the world. Bangladesh, a third world developing country of South Asia, is not a unique in this case. Consumption of unsafe food is a significant threat to public health in Bangladesh for last pair of decades<sup>1</sup>. A recent official statistics published by the Ministry of Health and family Welfare (MOHFW) of the Govt. of Bangladesh reveals that nearly half of food samples have been examined adulteration tested by the IPH (The Institute of Public Health) from 2001 to 2009<sup>2</sup>.

It is very important to have an understanding of the interaction on prevailing the food hygiene beliefs, knowledge and practices of food handlers in order to minimize food borne outbreak (WHO 2000).<sup>3</sup> There was general understanding of agreement revealed from several authors as the level of knowledge towards food safety on food hygiene among food handlers and the good effective practices of such knowledge in food handling that was imperative in ensuring the safe food production in any categorical operations.<sup>4-6</sup>

Besides the knowledge and practice on food hygiene is also a significant factor that can ensure a reduction of food borne disease.<sup>7</sup> It indicates that the correlation of positive and associated thinking and continued education of food handlers towards the maintenance of safe food handling practices<sup>5</sup>. This shows that if food handlers will interest to take serious note on the cleanliness of their hand, body and clothing, this will be helpful in preventing the incidence of cross-contamination from occurring<sup>8</sup>.

Food handlers play a vital role in transmitting pathogenic organisms especially in passive from contaminated sources such as transmission from raw meat to a ready to eat food. Food handlers may also carry out some specific pathogenic diseases such as Hepatitis A, Diarrhea, Norovirus, Typhoidal Salmonella, Staphylococcus aureus and Shigella in their hands, cuts or sores, by orally through skin and hair<sup>9</sup>. The World Health Organization (WHO) reports that there approximately 2 million fetal cases of food poisoning occur every year globally, especially in developing countries. This scenario could be due to the poor state of food hygiene knowledge in these countries.

DOI Number: <https://doi.org/10.30780/IJTRS.V05.I01.002>

pg. 5

[www.ijtrs.com](http://www.ijtrs.com)

[www.ijtrs.org](http://www.ijtrs.org)



In 2014, Malaysia recorded 49.79 cases of food poisoning per 100,000 populations. More than 50% of the total food poisoning cases were attributed to improper food handling by food handlers<sup>10-12</sup>. Food handlers' knowledge and practices on food hygiene play a paramount role in ensuring food hygiene and prevention of food disorders. Information on the food hygiene knowledge and hygiene practices of food handlers is scant. The discrepancy observed the previous research findings and epidemiological statistics that motivated to compare the real practice of hygiene to the knowledge and self-reported practices related to food hygiene among food handlers in restaurants. Food workers play a critical role in ensuring food hygiene but those who did not practice proper personnel hygiene including hand washing at the appropriate time and using appropriate methods can contaminate food. Food hygiene knowledge is very important to prevent food borne illness. So, prevention of food borne illness is one of the primary responsibilities of the food handler of restaurants<sup>13-16</sup>.

According to the U.S. Food and Drug Administration (FDA) (2006), the top three factors contributing to food contaminated illness in foodservice operations are: a) poor personal hygiene, b) cross-contamination and c) time/temperature control. Unsafe food hygiene practice poses global health threats and endangering everyone. Many cases of food borne diseases used to occur due to basic errors in food preparation or handling either in food services establishments or restaurants. The problem of food borne diseases are more prominent in developing countries due to prevailing poor food hygiene, inappropriate food handling practice, inadequate food hygiene laws and lack of education for food handlers<sup>17,18,19</sup>.

Food hygiene has been described by WHO (World Health Organization) as the conditions and measures necessary to ensure the safety of food from production to consumption. Food can become contaminated at any point during harvesting, processing, storage, distribution, transportation and preparation. Lack of adequate food hygiene can lead to food borne diseases and death of the consumers. In developing countries, up to estimated 70% of cases of diarrheal diseases are greatly associated with consumption of unhygienic food<sup>20,21</sup>.

## 1.1 Objectives of the Study

### 1.1.1 General Objective

To assess the level of knowledge and practice on food hygiene among food handlers of selected restaurants specially Sylhet city, Bangladesh

### 1.1.2 Specific Objectives

- To determine the socio demographic characteristics of the respondents.
- To assess the level of knowledge on food hygiene among food handlers.
- To assess the level of practice on food hygiene among food handlers.
- To explain the relationship of socio-demographic variables among knowledge and practices on food hygiene.

## 2. METHODS

This chapter described the methodology used in this study which included research design, setting, study population, sample and sample size, sampling technique, research instruments, ethical consideration and data collection procedure and data analysis. These are as following:

### 2.1 Study Design

A descriptive cross sectional study was conducted to explore food hygiene knowledge on practice among food handlers in Middle Class Restaurants from May to August -2018

### 2.2 Study Participants

This study was conducted at middle class 5 selected restaurants of medical road, rikabi-bazar, subhanighat and Modina market in Sylhet city, Bangladesh. The target population was the food handlers who were temporarily or permanently used to buy, prepare, store and serve food to their consumers.(Appayan restaurants in Medical road; Nurani restaurants in Medical road; Nuri restaurants in Rikabi Bazar; Delhi restaurants in Subhanighat; New Al-Rahat restaurants in Modina Market). Researcher distributed the questionnaire to 90 food handlers and the participants were filled up the questionnaire by self-reported. At last researcher got 84 questionnaire returned from the participants. A non-probability convenience sampling technique was used in this study. Here, this study was assured that the confidentiality and privacy would be maintained following inclusion criteria:

- All food handlers of the selected restaurants.
- Those who was willing to participate.
- Food handlers those who was available during the period of the study.

The sample size was calculated using a single population proportion formula by taking 95% confidence interval,



### 2.3 Data Collection Instrument

The instruments for data collection consist of three parts: Part I: The Socio demographic Data Questionnaire (SDQ) was developed by the researchers for food handlers' socio-demographic characteristics: age, gender, marital status, educational level, and work place. Part II: knowledge related characteristics on food hygiene 8 items with 3 point likert scale responses 3=Above/Both/High/Well known/Agree, 2=little/medium/not agree, 1=Low/Don't know/Not known. Part III: Food hygiene practice 8 items with 5 point likert scale responses from 1=Never practice, 2=rarely practice, 3= occasionally practice, 4 =Most practice and 5=Always practice.

All data collection questionnaire were developed by the researcher based on existing literature review. Three experts from department of public health, Leading University examined the contents of validity of those questionnaires. At first researcher prepared 47 items for this scale then according to the advice of expert deleted 19 items and modified 8 items. Before modification the score of my questionnaire was .80 and after modification it was .92. Reliability was tested by the pilot study within 20 food handlers from the other restaurants, Sylhet who were not included in the actual sample of the study before conducting actual research. The result of this study was .96 where acceptable internal consistency reliability using at least .70. Data was collected by semi-structured questionnaire using English version and before distributing to study sample it was translated into Bengali by back translated method.

### 2.4 Data Collection

Permission was obtained from the Institutional Review Board (IRB Memo No. LUS/PH/106/1202/25864/105), Faculty of Modern Science, Leading University. A formal permission for data collection also obtained from the manager. Verbal and written consent was taken from the food handlers to ensure their voluntary participation. Data was collected by the researcher himself. Face to face interview conducted with semi-structured questionnaire. Then researcher distributed 90 Bangla version questionnaire form to the subjects. Out of 90 distributed questionnaires, 84 returned and used for data analysis. The duration of data collection was from May 2018 to June 2018.

### 2.5 Data Analysis

Collected data were analyzed by using specially designed computerized "Statistical Package" (SPSS). Both descriptive and inferential statistics were used for data analysis. The descriptive statistics such as frequencies, percentages, mean, and standard deviation were used to organize and present socio-demographic characteristics. The inferential statistics, such as t-test and ANOVA test were used to examine the relationship of socio-demographic characteristic among food handlers on food hygiene knowledge and practice.

## 3. RESULTS

### 3.1 Socio-Demographic Characteristics

Eighty four food handlers were participated in this study. The age range of the respondent having 10 –20 years was half percent (50%). The out of total food handlers, 81% were male and 63% of them came from rural area. In occupation most of the them, 45% were waiter. And for education 49% also had passed their primary level. The respondents who had been working as food handlers, as their monthly income had 65% under 5000 taka.

**Table-3.1 Distribution of Socio-demographic Variables among Food Handlers (N=84)**

Variables	Frequency	Percent (%)	M±SD
<b>1. Age group (years)(min – max)=(8-30)</b>	84		16.1548± 5.97483
<10	22	26%	
10—20	42	50%	
>20	20	24%	
<b>2. Gender</b>			
Male	68	81%	
Female	16	19%	
<b>3. Residence</b>			
Urban	31	37%	
Rural	53	63%	
<b>4. Marital status</b>			
Unmarried	40	48%	
Married	29	34%	
Widow	15	18%	

<b>5. Occupational status</b>			
Cleaner	20	24%	
Waiter	38	45%	
Cooker	26	31%	
<b>6. Educational Level</b>			
Illiterate	36	43%	
Primary	41	49%	
Secondary	5	6%	
Higher Secondary	2	2%	
<b>7. Monthly Income(min-max)=(800-10000)</b>	84		3348.48±3324.894
< 5000 taka	55	65%	
5000– 10,000 taka	15	18%	
>10,000 taka	14	17%	

### 3.2 Distribution of Knowledge Related Variables among Food Handlers (N=84)

The assessment of knowledge on food hygiene that 83.3% could correctly define the meaning of hand washing. Out of total respondents, 72.6% showed the food hygiene term and 67.85% mentioned food borne diseases about the diarrhea. Concerning knowledge of the respondents, 56% had medium knowledge on idea of food handling and only 45.2% meant the term of food handling. But, 86.9% knew that dish towels could be a source of food contamination. The most of the respondents 77.4% also were aware of the common organisms about bacteria and virus. The 84.52% respondents found that food poisoning could cause faster multiplication in hot environment.

**Table-3.2 Distribution of Knowledge Related Variables among Food Handlers (N=84)**

Variables	Frequency	Percent (%)	M±SD
1. The term Hand washing means			2.77±.546
a) washing hands by soap and any clean water	5	5.95%	
b) washing hands by soap and tube well water	9	10.714%	
c) Above	70	83.33%	
2. The term food hygiene means			2.55±.782
a) maintain hygiene during food processing	15	17.9%	
b) maintain hygiene during food serving	8	9.5%	
c) Both	61	72.6%	
3. Do you have knowledge about the food borne diseases			2.48±.814
a) Well known	57	67.85%	
b) Little	10	11.90%	
c) Not known	17	20.23%	
4. Idea on food handling			1.8±.636
a) Low	27	32.1%	
b) Medium	47	56%	
c) High	10	11.9%	
5. The term food handling includes			1.77±.797
a) Properly food preparation	38	45.2%	
b) Properly food distribution	27	32.1%	
c) All of them	19	22.6%	
6. Dish towels can be a source of food contamination			2.83±.461
Agree	73	86.9%	
Don't agree	8	9.5%	
Don't know	3	3.6%	
7. Do you have knowledge about the common organisms causing food poisoning			1.32±.643
a) Well known	8	9.5%	

b) Little	11	13.1%	
c) Not known	65	77.4%	
8. Do you have any idea on environment causing food poisoning			2.73±.665
a) High	71	84.52%	
b) Medium	3	3.57%	
c) Low	10	11.90%	
Total (mean of mean)			2.15±.668

### 3.3 Distribution of Practice Related Variables among Food Handlers (N=84)

This part consists of 8 items in which food hygiene practice of the study participants measured by frequency, percentage, mean and standard deviation. Practice administration capacity was measured using 8 items with 5 point likert scale. Total score of food hygiene practice was  $m \pm sd = 3.88 \pm 1.059$ . Out of 8 items the two highest practices are for “take hand wash practice before food preparation (4.80±.597) and clean the food storage which is nearest similar (4.71±.769). Conversely the lowest 3 practice are “practice gloves before food preparation” (2.26±1.804), “preserve the cooked food” (3.48±1.156) and “practice the technique of water purification” (3.50±1.167).

**Table-3.3 Distribution of Practice Related Variables among Food Handlers (N=84)**

Variables	Never N(%)	Rare N(%)	Occasional ly N(%)	Most of the time N(%)	Always N(%)	M±SD
Do you take hand wash before food preparation	0(0%)	2(2.4)	2(2.4)	7(8.3)	73(86.9)	4.80±.597
Do you practice gloves before food preparation	55(65.5)	1(1.2)	2(2.4)	3(3.6)	23(27.4)	2.26±1.804
Do you wear mask during food serving and preparation	8(9.52)	4(4.76)	2(2.3)	8(9.52)	62(73.809)	4.33±1.311
Do you wear apron while working	4(4.76)	1(1.2)	10(11.9)	63(75)	6(7.14)	3.79±.793
Do you practice the technique of water purification	10(11.90)	8(9.52)	4(4.76)	54(64.28)	8(9.52)	3.50±1.167
Do you practice the food covered technique during food transportation	2(2.38)	4(4.76)	2(2.38)	46(54.76)	30(35.714)	4.17±.876
Do you preserve the cooked food	10(11.9)	8(9.52)	5(5.952)	54(64.28)	7(8.33)	3.48±1.156
Do you clean the food storage area before storing new products	1(1.19)	2(2.38)	4(4.76)	6(7.14)	71(84.52)	4.71±.769
Total(mean of mean)						3.88±1.059

### 3.4 Relationship of Socio-demographic Characteristics among Knowledge and Practice

Table 4 represent that the Relationship of socio-demographic characteristics among knowledge and practice by t test and ANOVA test and where significance level is measured by  $<.05$ . In food hygiene this table showed that there is a significant relationship of socio demographic characteristics among knowledge and practice on food hygiene.

**Table-3.4 Relationship of Socio-demographic Characteristics among Knowledge and Practice**

Variables of socio-demographic characteristics	Knowledge		Practice	
	M±SD	t/F (p)	M±SD	t/F (p)
1. Age (min – max ) = (8-30)				
< 10 yrs	16.68±.77	81.787(.000)	37.95±1.36	147(.000)
10- 20 yrs	17.25±.77		32.45±1.61	
>20 yrs	19.54±1.74		20.45±6.41	
2. Gender		.		

Male	18.61±1.54	523(.472)	33.97±3.31	13.454(.000)
Female	16.68±1.44		18.56±5.73	
3. Residence				
Urban	17.29±1.32	1.314(.255)	37.06±1.99	30.29 (.000)
Rural	18.81±1.65		27.50±6.76	
4. Marital status				
Unmarried	17.87±1.60	32.694(.000)	35.93±2.76	1.77(.000)
Married	19.65±.48		31.03±1.74	
Widow	16.53±1.35		18.00±5.46	
5. Occupational status				
Cleaner	16.65±.81	40.46(.000)	38.05±1.39	1.77 (.000)
Waiter	19.50±.97		32.95±1.73	
Cooker	17.65±1.69		22.85±7.18	
6. Educational status				
Illiterate	18.36±1.57	3.814(.013)	34.83±2.84	23.65(.000)
Primary	18.48±1.74		26.20±7.22	
Secondary	16.40±.54		39.80±.44	
Higher secondary	16.00±.00		40.00±.000	
7. Monthly income				
< 5000 taka	18.45±1.66	16.02(.000)	34.85±2.94	156.107(.000)
5000—10,000 tk	19.26±.45		29.73±2.25	
> 10,000 taka	16.35±1.21		17.43±5.18	

#### 4. DISCUSSION

As Sylhet is one of the speediest growing cities of Bangladesh in the South East Asia in terms of business, economy and tourism, this city manage to attract an enormous number of people for having the natural beauty beside their business and also help to get the higher quality of service standards including the food industry. Based on that, this study is aimed to address one of the vital concerns in Sylhet and a cornerstone in the attraction of this country. This study is one of the very few or may be the unique study in Sylhet to tackle hygienic practices among food handlers. This study assessed the level of knowledge and practice on food hygiene among food handlers of selected restaurants in Sylhet and overall it revealed that there were statistically significant relationships with most of socio demographic variables.

In this study, the respondents 50% are mainly within the age range of 10—20 years which is contrary to findings of the study conducted among chotpoti vendors in Bangladesh and also contrary to significantly ages group in another study.<sup>14,23,24,25</sup> In our country, this age group demands are limited and the manager easily get them at a low cost and also they don't need skillful person that's why this age group percentage are significant in my study. In this study, there are more respondents are male than female also similar study indicated more male.<sup>23</sup> Another study indicates more female.<sup>14,26-28</sup> In Bangladesh because of having cultural orientation, religious attitude and gender bias, male persons do their job in front side. So, Male person are predominant in my study.

More of the respondents 48% are unmarried which is contrary to findings of other studies conducted among food handlers.<sup>23,24,29,30</sup> According to law of marriage in Bangladesh is about 18 years, is the legal age. The highest educational level 49% of the respondents in this study are primary which is similar to the study.<sup>23</sup> But here nearly half of respondents did not have good formal education which is consistent with findings from other parts of the world.<sup>26,29</sup> In our country, because of familial economic burden, that age group are deprived of education. In this study, 72.6% respondents of the food handlers had a good knowledge on food hygiene and similar to another study.<sup>19,25,30</sup> Though the respondents don't have any institutional qualification but knowledge is high because in Bangladesh primary health care is very strong at rural level.

In this study 27.4% put the use of gloves whereas another study indicates always put the gloves practice but here usually 73.8% do the mask practice. The 75% respondents practice the wearing of apron in most of the time while they are working whereas in another study observed more than 50% apron practice.<sup>23,25,26,31</sup>

The out of total respondents in this study had average knowledge 71.6% and practice 77.6% In another study observed all the respondents had consistently good knowledge (58.3%), attitude (81.7%) and practice (79.0%). Knowledge, attitude, and practices of food safety among women of Khaza bazar, the urban field practice area of KBN Institute of Medical Sciences, Kalaburagi, Karnataka.<sup>32</sup> Though most of respondent from the age group of 10-20 but in the relationship with knowledge >20 years old respondents had good knowledge which is statistically significant. It is actually common thing that more aged people have more knowledge. In marital status married person had more knowledge than unmarried because they can easily earn knowledge from their wives who



are used to handle the food to their home. Waiters also preserve more knowledge than cooker and cleaner because they can gain knowledge from various level of customer. In practice, unmarried person were more perfect than married because they do not give the extra time for the practice at home conversely married person when they go home, they prefer to help their spouse. For occupation cleaners were more expert than others because all managers generally give special attention for cleanliness for attraction of newcomer.

## CONCLUSION

The improvement of knowledge and practice on food hygiene should ensure through structured food hygiene training on wholesome food to the consumers.

## LIMITATIONS OF THE STUDY

Although Time constrain, the fund is not enough & small sample size but the confidentiality of information data was ensured. Besides, the participants may have provided incorrect answers to the questions as a result of fear of disclosure, blame as well as decreasing of professional reputation which can be considered as the limitation of my study.

## RECOMMENDATION

This study showed that food handlers don't have enough educational level. So, infrequent practices on gloves, mask, apron, food covered transportation, inappropriate management of food preservation that creates numerous possibilities of food contamination. As knowledge level is low compared with practice so;

- The adult literate employee should be appointed to do frequent practice on gloves compared with the practice of mask, apron and others especially among junior or newly appointed food handlers so that knowledge and practice put the good level at the same time.
- Improvement of food hygiene practices strictly should be implemented to promote interactive adult teaching strategies through strengthening of awareness dealing with the proper food handling practices.
- If anyone want to conduct this study again should be done with big sample size, select randomly and compare with the tertiary level restaurants.

## REFERENCES

- [1] The Survey was cited in Quazi Mohammad Ali, "Some Aspects of Consumer Protection in Bangladesh," The Dhaka University Studies Part-C 111, 1984
- [2] See the details of the table on "Public Health Interventions by Selected Institutions," Directorate General of Health Services, accessed November 15, 2012, [http://nasmis.dghs.gov.bd/dghsnew/dmdocumentsAll/Public%20Health%20Int ervations.pdf](http://nasmis.dghs.gov.bd/dghsnew/dmdocumentsAll/Public%20Health%20Int%20erventions.pdf), 6.
- [3] World Health Organisation (WHO), Foodborne Disease: Focus on Health Education. WHO, Geneva, 2000.
- [4] Mortlock, M. P., Peters, A.C. & Griffith, C. Food hygiene and HACCP in the UK food industry, practices, perceptions and attitudes. *Journal of Food Protection* 62:786-792, 1999.
- [5] Bas, M., Ersun, A.S. & Kivanc, G. The evaluation of food hygiene knowledge, attitudes and practices of food handlers in food businesses in Turkey. *Journal of Food Control* 17:317-322, 2004.
- [6] Nel, S., Lues, J.F.R., Buys, E.M. & Venter, P., The personal and general hygiene practices in the deboning room of a high throughput red meat abattoir. *Journal of Food Control* 15:571-578. 2004.
- [7] Howes, M., McEwen, S., Griffiths, M. & Haris, L., Food handler certification by home study: measuring changes in knowledge and behaviour. *Dairy Food Environmental Sanitation* 3:208-214, 1996.
- [8] Sneed, J., Strohbahn, C., Gilmore, S.A. & Mendonca, A. Microbiological Evaluation of foodservice contact surfaces in Iowa assisted-living facilities. *Journal of American Dietitians Associations* 104:1722-1724, 2004.
- [9] M.R. Adams and M.O. Moss, "Food Microbiology," 3<sup>rd</sup> Edition, The Royal Society of Chemistry, Cambridge, 2008.
- [10] World Health Organization (WHO). Food Safety; WHO: Geneva, Switzerland, 2015. Available online: <http://www.who.int/mediacentre/factsheets/fs399/en/> (accessed on 19 October 2016).
- [11] Ministry of Health (MOH). Health Facts 2014; MOH: Putrajaya, Malaysia, 2014.
- [12] Ministry of Health (MOH). Annual Report 2007; MOH: Putrajaya, Malaysia, 2007.
- [13] Michaels, B.; Keller, C.; Belvins, M.; Paoli, G.; Ruthman, T.; Todd, E.; Griffith, C.J. Prevention of food worker transmission of foodborne pathogens: Risk assessment and evaluation of effective hygiene intervention strategies. *Food Serv. Technol.* **2004**, 4, 31-49. [CrossRef]
- [14] Hui Key Lee et al. Assessment of Food Safety Knowledge, Attitude, Self-Reported Practices, and Microbiological Hand Hygiene of Food Handlers, *International Journal of Environmental Research and Public Health*, 2017, 14, 55; doi: 10.3390; <http://www.mdpi.com/journal/ijerph>.



- [15] The FDA Report on the Occurrence of Foodborne Illness Risk Factors in Selected Institutional Foodservice, Restaurant, and Retail Food Store Facility Types(2009).
- [16] Cushman, J.W., Shanklin, C.W., & Niehoff, B.P. (2001). Hygiene practices of part-time student employees in a university foodservice operation. *The Journal of the National Association of College & University Food Services*. Available at: [http://www.nacufs.org/resources/publications/journal\\_2001.pdf](http://www.nacufs.org/resources/publications/journal_2001.pdf).
- [17] WHO. Foodsafety. Retrieved online at <http://www.who.int/mediacentre/factsheets/fs399/en/> on 21st February, 2017.
- [18] Mwamakamba L, Mensah P, Fontannaz-ajoulat F, Hlabana M, Maiga F, Bangoura F, Mohamed C and K Ingenblee. The WHO Five Keys to Safer Food: A tool for Food Safety Health Promotion. *African Journal of Agriculture, Food, Nutrition and Development*. Vol. 12, No4, 2012.
- [19] Tessema AG, Kasshun AG and DC Haile. Factors Affecting Food Handling Practices among Food handlers of Dangila town food and drink establishment, North West Ethiopia. *BMC Public Health*,14-571, 2014.
- [20] Akanbanda F, Hlortsi E and J Owusu-Kwarteng. Food safety knowledge, attitudes and practices of institutional food-handlers in Ghana. *BMC Public Health*,17:40, 2017.
- [21] Zeru K and A Kumie. Sanitary conditions of food establishment in Mekelle town, Tigray, North Ethiopia. *Ethiop. J. Health sci.*; 2(1):1-9, 2007.
- [22] Nigusse D, Kumie A: Food hygiene practices and prevalances of intestinal parasites among food handlers working in Mekelle university students cafeteria, Mekelle. *Global Adv Res J SocSci (GARJSS)*,1(4):065-071. 2012.
- [23] Hassan M Z et al; Food safety knowledge, Attitude and Practices of Chotpoti vendors in Dhaka, Bangladesh. *J Enam Med Col* 2017;7(2):69-76, 2017.
- [24] Tolulope et al. 017, Knowledge and practice of food safety and hygiene among food vendors in primary school in Jos, Plateau State, North Central Nigeria.
- [25] Anthony C.Iwu, et al.(2017) Knowledge, Attitude and Practices of Food Hygiene among Food vendors in Owerri, Imo State, Nigeria .*Occupational Diseases and Environmental Medicine*,2017,5,11-25,<http://www.scirp.org/journal/odem>,<https://doi.org/10.4236/odem.2017.51002>.
- [26] Chukuezi OC. Food safe and hygiene practices of street food vendors in Owerri, Nigeria. *Stud SociolSci*,1:50-57,2010.
- [27] Musa OI, Akande TM, Food hygiene practices of food vendors in secondary schools in Ilorin. *Niger Postgrad MedJ*,10:192-196, 2003.
- [28] Smith IS, Agomo CO, Bamidele M, Opere OB, Aboaba OO ,Survey of food handlers in bukas (a type of local restaurant) in Lagos, Nigeria about typhoid fever. *Sci Res*,2:951-956, 2010.
- [29] Abdalla MA, Suliman SE, Alian HA, Bakhiet A, Food safety knowledge and practices of street food vendors in Khartoum City. *Sudan J Vet Sci Anim Husb*,47:126-131, 2008.
- [30] Zain MM, Naing NN (2002). Socio-demographic characteristics of food handlers and their knowledge, attitude and practice towards food sanitation: A preliminary report. *Southeast Asian J Trop Med Public Health*. 2002, 33 (2): 410-417. PubMed PMID: 12236444. Epub 2002/09/19. [engPubMedGoogleScholar](http://pubmed.ncbi.nlm.nih.gov/).
- [31] Muinde O, Kuria E, Hygienic and sanitary practices of vendors of street foods I nairbi, Kenya 2005;5(1):1-13.
- [32] MendagudaliRR, AkkaKD, Swati IA, Shedole DT, BendigiriNAD, Knowledge, attitude, and practices of food safety among women of Khaza bazar, the urban field practice area of KBN Institute of Medical Sciences, Kalaburagi, Karnataka. *Int J Med Sci Pub Health* 2016;5(3):516-525.