



## **Food Handling Practices among Food Handlers of Eating Establishments in the Government Hospitals, Mandalay City, Myanmar**

**Si Thu Aung<sup>1\*</sup>, Aung Aung Nwe<sup>2</sup>, War War Shan<sup>3</sup>, Soe Moe Naing<sup>3</sup>,  
San San Htay<sup>4</sup> and Kyaw Kyaw<sup>5</sup>**

<sup>1</sup>*Department of Medical Services, Myanmar.*

<sup>2</sup>*Department of Physiotherapy, University of Medical Technology, Mandalay, Myanmar.*

<sup>3</sup>*Department of Preventive and Social Medicine, University of Medicine, Mandalay, Myanmar.*

<sup>4</sup>*Department of Preventive and Social Medicine, University of Medicine 2, Yangon, Myanmar.*

<sup>5</sup>*Department of Food and Drug Administration, Mandalay Branch, Myanmar.*

### **Authors' contributions**

*This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.*

### **Article Information**

DOI: 10.9734/ACRI/2019/v16i230087

*Editor(s):*

(1) Ass. Prof. M. A. Elbagermi, Analytical Chemistry, Chemistry Department, Faculty of science, Misurata University, Libya.

*Reviewers:*

(1) Ilaria Proietti, Italy.

(2) Samuel Adeyeye, Ton Duc Thang University, Vietnam.

(3) Aly Farag El Sheikh, McMaster University, Canada.

Complete Peer review History: <http://www.sdiarticle3.com/review-history/47380>

**Received 11 November 2018**

**Accepted 15 February 2019**

**Published 04 March 2019**

**Original Research Article**

### **ABSTRACT**

**Background:** Hospital environment is a favourable condition for growing of pathogens. Unhygienic practices of food handlers and contaminated food may be the cause of foodborne diseases, resulting in much comorbidity and longer hospital stay of the affected persons.

**Aims:** To study socio-demographic characteristics, working characteristics and food handling practices among food handlers of eating establishments in the government hospitals, Mandalay city, Myanmar.

**Study Design:** Cross-sectional descriptive study.

**Place and Duration of Study:** One hundred and eleven eligible food handlers from government hospitals in Mandalay city, Myanmar between May 2018 and August 2018.

**Methodology:** Face to face interviews with all eligible food handlers were carried out with

\*Corresponding author: Email: [chanzay2012@gmail.com](mailto:chanzay2012@gmail.com);

pretested questionnaire. Observational checklist was used for current situation of food handlers.  
**Results:** The majority of employees were female and full-time food handlers. No pre-employment and periodic medical examinations of food handlers were done. More than half (54.05%) of total food handlers had unsatisfactory on food handling practices. Food handling practices status was influenced by duration of working in the current jobs ( $P=0.001$ ).  
**Conclusion:** There was high status of unhygienic food handling practices of the food handlers working in the eating establishments of the government hospitals, Mandalay city, Myanmar.

*Keywords: Food handling practices; food handlers; hospital food handlers; safe food in hospitals.*

## 1. INTRODUCTION

Food, a basic need for human beings, is usually derived from animal or plant origin. It provides human beings not only nourishment but also nutritive components such as carbohydrates, fats, proteins, essential minerals and vitamins. Because of food, human beings can sustain life, generate energy and development of body, and maintain their health status [1].

As food is one of the most essential basic needs for human beings, assessing to safe food is important. Food adulteration is a rising problem as it decreases food products' quality resulting significant consequences for human health and economic damage [2,3]. Some consumers may regard safe food as food that does not make a person sick. Others may describe safe food as food that is within its shelf life and has been stored or distributed at the proper temperature. Some consumers may define safe food as food that is not "contaminated". The colloquium on food safety for the American Academy of Microbiology has described safe food as the following: Safe food, if properly handled at all steps of production, processing, distribution, from retail and food service business through consumption, is reliably unlikely to cause illness or injury. Recently, World Health Organization (WHO) defined food safety as a term that generally refers to ways and approaches to ensure that the production, preservation, distribution and consumption of food happen in a safe manner [3,4]. Food is said to be unsafe when it contains harmful pathogens (bacteria, viruses, parasites) and chemical substances. Unsafe food creates a vicious cycle of disease and malnutrition. Ingestion of unsafe food results in many unhealthy conditions ranging from self-limiting or mild diarrhea to cancers. Regarding an estimated 600 million, almost 1 in 10 people fall ill because of eating contaminated food, around 0.42 million people die yearly and 33 million people loss healthy life year [5].

Foods can be contaminated at any link of food chain, from food production to services. The risks of food contamination largely depend on health status of food handlers & their hygiene behaviors and practices. Often these food handlers are appointed without proper health examination [6]. The food handlers play a major role in ensuring food safety and prevention of food poisoning [7]. The mishandling of food and the disregard of hygienic measures enable pathogens to come into contact with food and, in some cases, to survive and multiply in sufficient numbers to cause illness in consumers [8]. Personal hygiene and environmental sanitation are key factors in the transmission of food-borne diseases [9]. It is thought that hand hygiene could serve as an indicator of the food handlers adherence to safe food practices during food preparation [10]. Food safety training is positively associated with self-reported changes in food handling practices [11]. Simple and rapid traceability tool ensures high-quality food inspection to deliver safer food for customers [3,12,13,14]

Hospital environment may contribute with dissemination of pathogens. Environments occupied by colonized and/or infected patients generally can become contaminated [15]. Older adults, preschool age children, infants and patients with certain conditions such as cancer, diabetes, Human Immunodeficiency Viral (HIV) infected patients and transplant patients are more likely to experience food-borne diseases than others [16].

Eating establishments in hospitals cater to a large population group comprising of patients, doctors, nurses, hospital staffs, medical students, visitors of patients etc. Because food prepared in large quantities is more liable to contamination, there is a greater potential for the occurrence of food-borne disease outbreaks if basic sanitary practices are not maintained [17].

Centers for Disease Control and Prevention (CDC) estimates that 48 million people suffer

foodborne illness, 128,000 are hospitalized, and 3,000 die in the United States yearly [18]. In Europe, it was reported that approximately 4786 foodborne outbreaks (including waterborne outbreaks) occurred in 2016 [19]. In Myanmar, diarrhea and dysentery are ranked fourth in the list of national priority diseases [20].

Food-borne illness is acute gastroenteritis with the symptom of abdominal pains, diarrhea, vomiting, fever and headache [18]. Outbreaks and sporadic cases of food-borne diseases are regular occurrences in all countries of the world. Food-borne diseases are globally important, since it they result in considerable morbidity, mortality, and economic costs [4,21]. The occurrence of food-borne diseases has been increased, frequently associated with outbreaks, and threatens global public health safety and raises international concern. Every year, food borne and waterborne diarrheal diseases kill about 2.2 million people, including 1.9 million children [4].

Food handlers have the most important role in food safety because they may be the transfer sources of microbial pathogens for food contamination from their hairs, skin, hands, respiratory tracts and digestive systems if they are in ill health. Moreover, the unsafe food handling practices of food handlers can cause foodborne diseases. The hands of the food handlers can transmit infection from hands to mouth, eye, nose, skin or indirectly by handling of food or water. In addition, hands hygiene of food handlers is one of the most important points to attain safe food. Therefore, this study determined food handling practices of the food handlers working in eating establishments of the government hospitals in Mandalay city, Myanmar.

## 2. METHODOLOGY

### 2.1 Study Area

In Mandalay city, there were eight government hospitals having eating establishments. Among these hospitals, there were seventeen eating establishments. This study was done in all these eating establishments of the eight government hospitals.

### 2.2 Study Population

The study population comprised of all eligible food handlers (involved in food preparation and

cooking) employed in eating establishment of the hospitals.

### 2.3 Sample Size Estimation

Sample size was calculated by using  $n = \frac{Np(1-p)z^2}{d^2(N-1) + p(1-p)z^2}$  for finite population proportion where N=population size assuming 150 food handlers working in the eating establishments of the government hospital, Mandalay city, p=expected proportion of satisfactory practice among 172 food handlers of selected restaurants in Nay-pyi-taw=54.1%, z=1.96 (confidence interval=95%), d=precision=5%. Therefore, the minimum required sample size n=108.

### 2.4 Study Design

This was a cross-sectional descriptive study designed to determine food handling practices among food handlers of eating establishments in the government hospitals, Mandalay city, Myanmar.

### 2.5 Selection Criteria

Food handlers working in the eating establishments within the compound of government hospitals who were involved in food preparation and cooking were selected for the study. Food handlers who were not involved in food preparation and cooking were excluded.

### 2.6 Data Collection Method and Tools

After taking written informed consent, face to face interviews with food handlers were carried out with pretested semi-structured questionnaire. The food handlers were briefed on the purpose and importance of the study in which confidentiality and anonymity of response were assured to them. Observational checklist was used to collect information on current situation of food handlers. The observation was done the same day the questionnaire would be administered.

The questions were modified and adopted from WHO (2006) "Five Keys to Safer Food Manual" [22] and "Myanmar FDA Observational Checklist for kitchen". The questionnaire was pretested on seven food handlers in 300-bedded Pyin-oo-lwin hospital which were not included in this study. The questions were modified as required in order to improve clarification. By using the Cronbach's alfa test, the reliability coefficient test for

practices was 0.8. This reliability of questionnaire was also ensured.

The survey questionnaire contained four parts. The first part consisted of four items regarding to food handler's socio-demographic characteristics including age, sex, education and monthly income of food handlers. The second part consisted of eight items regarding to working characteristics including types of food they were handling, working hours per week, employment status, duration of working in the current job, pre-employment and regular periodic medical examinations, food safety training and their self-reported current health conditions.

The third part consisted of sixteen questions regarding to food handling practices among food handlers. It covers practices regarding to food handlers' handwashing and food handling practices during their illnesses. The food handlers were asked for doing the stated practice "Never", "Sometimes", "Always". The direction of the scale was (2to0) and reversed (0to2) for some questions to check validity of responses.

The fourth part consisted of twenty-one items of observational checklist for food handler's practices. It covers practices regarding to personal hygiene, safe food handling practices and situations of working area of food handlers. This was checked for doing the stated practice "Yes" or "No". The direction of the scale was (1to0) and reversed (0to1) for some questions to check validity of responses. Total practices score of food handlers were categorized as "Satisfactory" and "Unsatisfactory" according to their respective median value.

## 2.7 Data Processing and Analysis

Data was checked daily after collection for completeness and correction. Data entry was done by using software EpiData 3.1. Statistical analysis was performed with statistical software StataSE 13. Mean and standard deviation were used to summarize normally distributed continuous variables. Median and interquartile range for non-normally distributed continuous variables. Normality of the variables was checked by skewness/kurtosis test and histogram. Categorized continuous variables and categorical variables were summarized by using frequency distribution tables. Chi-squared test ( $X^2$ ) was used for categorical variables. Fisher's exact test was used for categorical variables when the expected value was less than 5. The significance level was considered as .05.

## 2.8 Ethical Consideration

Approval of this study was obtained from Research and Ethics Committee of the University of Medicine, Mandalay (UMM). Eligible food handlers were explained about aims and objectives of the study, contents of questionnaire and observational checklist, possible risks and benefits of participation in this study and duration of the conduct time. They were asked to participate in the study voluntarily with their signed written informed consent.

## 3. RESULTS

The socio-demographic characteristics of food handlers are shown in Table 1. Among food handlers, (40.54%) were in age group of 21-30years. The youngest food handler was 18years and the eldest being 60years. The mean age (Standard Deviation, SD) was 29.41years (11.08 years) with median age 26years. In this study, (71.17%) were females and male-female ratio was 1:2.47. Most (32.43%) of food handlers got middle school level, followed by primary school level (28.83%). The monthly individual incomes of food handlers ranged from 30,000 to 2,000,000 kyats, with a mean of 193783.8 kyats and a median (IQR) was 100,000 kyats (80,000 – 150,000). Among them, (38.74%) had a monthly individual income less than 100,000 kyats.

Table 2 shows types of food handling among food handlers. In this study, (54.05%) of food handlers were most handling rice and curry. Next, (46.85%), (31.53%), (26.13%), (21.62%) and (11.71%) of food handlers handled raw vegetables, food prepared before selling, raw meat, hot drink (tea, coffee) and fruit respectively. Only (5.41%) of food handlers were handling cold drink.

Table 3 shows working characteristics of food handlers. The working hours per week of food handlers ranged from 28 to 112 hours, with a mean of 76.31 hours and a median (IQR) was 77 hours (70-90 hours). In exploring, (82.88%) of food handlers were employees and other (17.12%) were family business persons. There was no part time employee. The duration of working in the current job ranged from 1 month to 15 years, with a median (Intra Quartile Range, IQR) of 11 months (2 months – 2 years) and mean (SD) was 32.68 (42.73) months. Nearly half of food handlers (51.35%) had duration of working in the current job of less than 12 months and (18.92%) had more than 5 years. All food

handlers answered that they had not been screened for any disease before they were employed at eating-establishments. All food handlers had not received regular periodic medical examination. Almost all (98.20%) of the food handlers had no training on food safety during their working period. Among food

handlers, (90.09%) were feeling well and (9.91%) responded feeling unwell. Among food handlers responding feeling un-well, seven food handlers suffered sneezing/running nose, three did only cough and the last one had cough with sneezing/running nose.

**Table 1. Socio-demographic characteristics of food handlers**

Characteristics	Variables	Frequency n=111	Percentage (%)
Age group (completed years)	18-20	28	25.23
	21-30	45	40.54
	31-40	21	18.92
	41-50	9	8.11
	51-60	8	7.21
Sex	Male	32	28.83
	Female	79	71.17
Education status	Illiterate	4	3.60
	Read and write	6	5.41
	Primary school	32	28.83
	Middle school	36	32.43
	High school	22	19.82
	Graduate/Diploma	11	9.91
Monthly Individual Income (Kyats)	<100,000	43	38.74
	≥100,000	68	61.26

**Table 2. Types of food handling among food handlers**

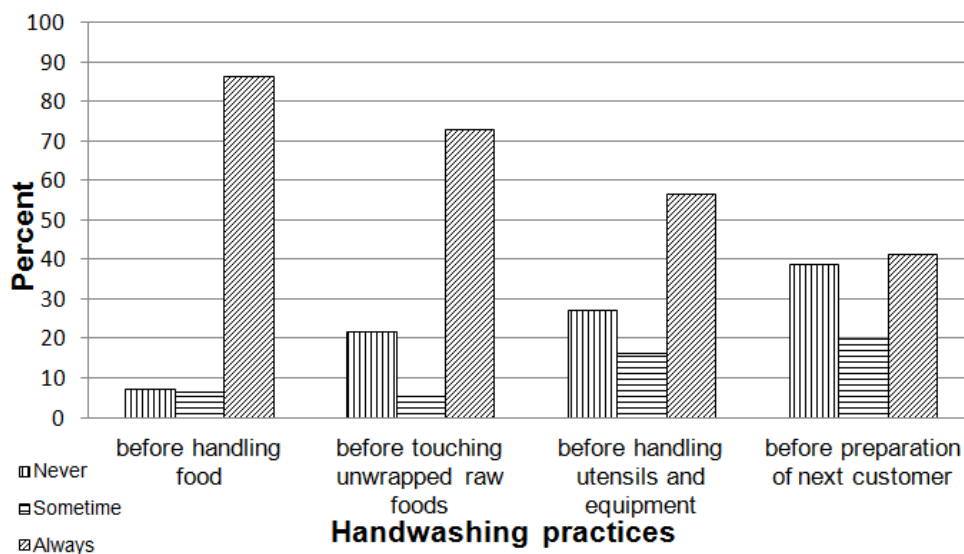
Types of food	Variables	Frequency n=111	Percentage (%)
Rice & curry	Handling	60	54.05
	Not Handling	51	45.95
Raw vegetables	Handling	52	46.85
	Not Handling	59	53.15
Food prepared before selling	Handling	35	31.53
	Not Handling	76	53.15
Raw meat	Handling	29	26.13
	Not Handling	82	73.87
Hot drink (tea, coffee)	Handling	24	21.62
	Not Handling	87	78.38
Fruits	Handling	13	11.71
	Not Handling	98	88.29
Cold drink	Handling	6	5.41
	Not Handling	105	94.59

**Table 3. Working characteristics of food handlers**

Characteristics	Variables	Frequency n=111	Percentage (%)
Employment Status	Employee	92	82.88
	Family business person	19	17.12
Duration of working in the current job (months)	<12	57	51.35
	12-24	13	11.71
	25-36	9	8.11
	37-48	6	5.41
	49-60	5	4.50
	>60	21	18.92
Pre-employment medical examination	Yes	0	0.00
	No	111	100.00
Regular periodic medical examination	Yes	0	0.00
	No	111	100.00
Food safety training	Yes	2	1.80
	No	109	98.20
Self-reported Current Health Conditions	Feeling well	100	90.09
	Feeling un-well	11	9.91

Fig. 1 shows approximately (86.49%) of food handler always wash hands before handling food. More than one fifth (21.62%) answered they never wash hands before touching unwrapped raw foods but majority (72.97%) always wash their hands. The majority of food handlers (56.76%) always wash their hands before

handling utensils and equipment. Regarding situations for washing hands among food handlers, (41.44%) always wash their hands before preparation of next customer, (38.74%) never wash and only (19.82%) answered sometime wash their hands.



**Fig. 1. Handwashing practices before activities among food handlers (n=111)**

Fig. 2 shows almost all (99.10%) always wash their hands after using toilet at work and only one food handlers (0.9%) responded sometime wash their hands. Among food handlers, (96.40%) always wash their hands after disposing rubbish at work. The majority of food handlers (85.59%) always wash their hands after touching unwrapped raw foods while (8.11%) and (6.31%) of them wash sometimes and never respectively. Regarding the situations for washing hands among food handlers, (62.16%) always wash their hands after touching skin, face and hair at work. Over half (53.13%) of food handlers answered that they always wash their hands after

sneezing and coughing at work, (27.03%) wash sometime and only (19.82%) did not washed their hands.

Table 4 shows most of food handlers (86.49%) wash their hands with water and soap while (13.51%) of did handwashing using water without soap. In this study, tissue and clean towels are materials mostly used to dry after washing their hands with (47.75%) and (46.85%) respectively. But incorrect practices (no materials used to dry their hands after washing hand and materials using their wearing clothes) were found (2.70%) of food handlers in each types.

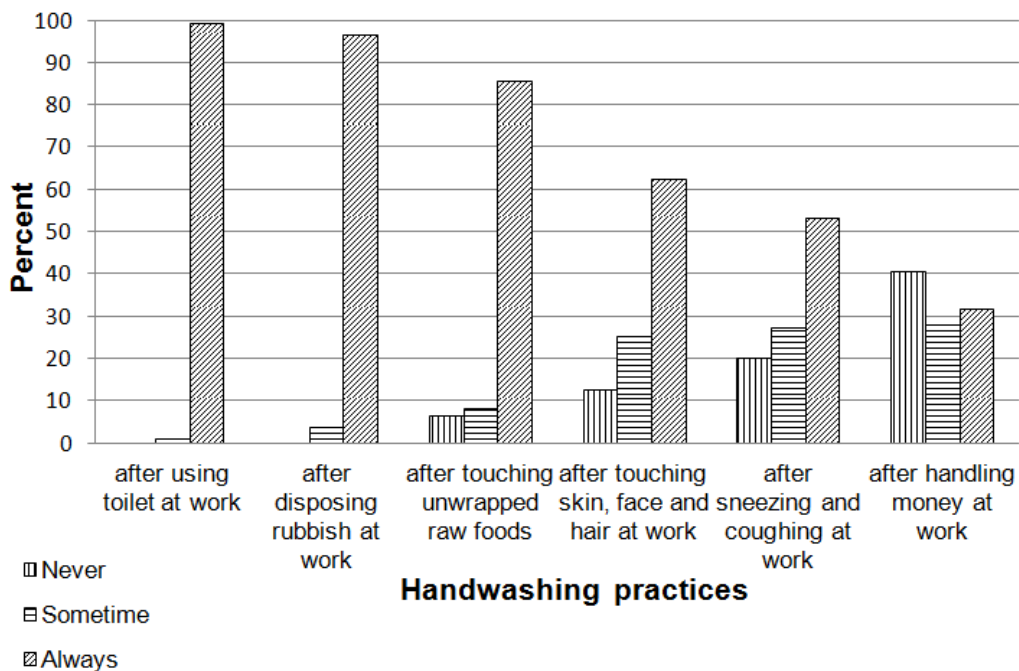


Fig. 2. Hand washing practices after activities among food handlers (n=111)

Table 4. Handwashing characteristics of food handlers

Characteristics	Variables	Frequency n=111	Percentage (%)
Methods of handwashing	With using water without soap	15	13.51
	With using water and soap	96	86.49
Materials mostly used to dry their hands after washing their hands	No materials use	3	2.70
	Wearing-clothes	3	2.70
	Clean towel	52	46.85
	Tissue	53	47.75
	Hand dryer	0	0.00

About (55.86%) of food handlers had quitted food preparation while suffering diarrhoea, (43.24%) had quitted while suffering flu or cold, (36.04%) while coughing and (35.14%) of them had quitted food preparation while sneezing/running nose shown in Fig. 3.

According to checklist Table 5, there were (100%) correct practices that are not having sneezing, coughing, blowing air in the bags

before adding food, having domestic water supply and presence of soap for hand washing. Similarly, there were higher percentages of correct practices that are not having any skin infection in hands (99.10%), wearing clean clothes and using clean utensils (98.20% in each item), presence of clean working area and free if insects and pests in these working areas (96.40% in each item), not having a habit of smoking (92.79%) and betel chewing (88.2 %)

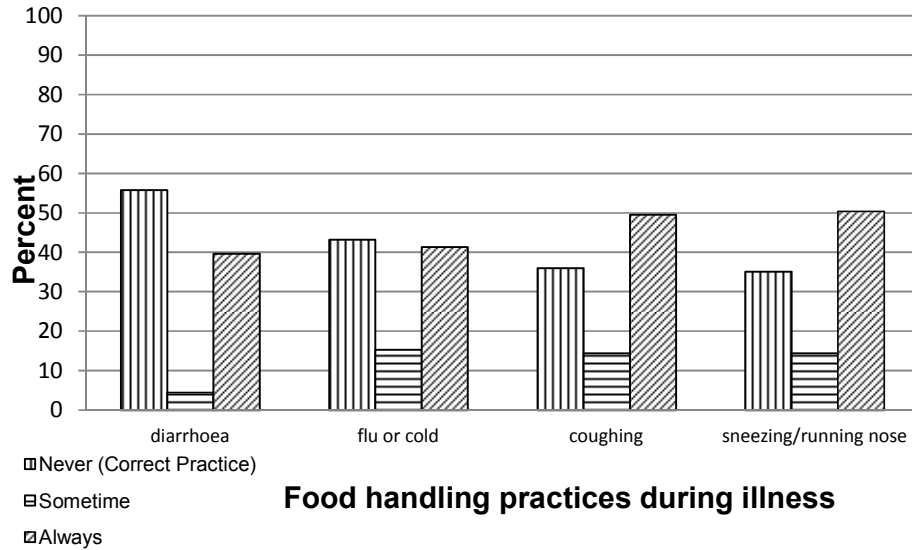


Fig. 3. Food handling practices during illness (n=111)

Table 5. Frequency distribution of food handling practices checked by observation (n = 111)

Items	Correct Practice		Incorrect Practice	
	n	%	n	%
Clean, short and trimmed nail	82	73.87	29	26.13
Skin infection in hand	110	99.10	1	0.90
Having medical certificate from township medical officer (TMO)	0	0.00	111	100.00
Wearing disposable gloves	22	19.82	89	80.18
Wearing caps	3	2.70	108	97.30
Wearing masks	1	0.90	110	99.10
Wearing apron	5	4.50	106	95.50
Wearing rings and hand chain	89	80.18	22	19.82
Wearing clean cloths	109	98.20	2	1.80
Used utensils are clean	109	98.20	2	1.80
Sneezing and coughing	111	100.00	0	0.00
Blowing air in the bags before adding food	111	100.00	0	0.00
Handle cooked food with bare hand	77	69.37	34	30.63
Smoking during working hours	103	92.79	8	7.21
Betel chewing during working hours	98	88.29	13	11.71
Domestic water supply for hand washing	111	100.00	0	0.00
Presence of soap for hand washing	111	100.00	0	0.00
Working area is clean	107	96.40	4	3.60
Presence of insects and pests in working area	107	96.40	4	3.60
Presence of dust bin	98	88.29	13	11.71
Is there a dust bin with cover (fly proof)?	11	9.91	100	90.09



during working. Around four fifth of food handlers (80.18%) did not wear rings and hand chain while handling food, (73.87%) has clean, short and trimmed nail and (69.37%) did not handle cooked food with bare hand. But there were also higher percentages of incorrect practices that are not having medical certificate (100.00%), not wearing masks (99.10%), not wearing caps (97.30%), not wearing apron (95.50%), not having dust bin with fly proof cover (90.09%) and not wearing disposable gloves (80.18%) while handling food.

Regarding practice score, minimum score was 20 while maximum one was 45 upon 51 given marks. Mean score (SD) was 35.01 (4.74) and median (IQR) was 35 (32-38). In this regards,

unsatisfactory practice group ( $\leq$  median) was observed to be 60 (54.05%) and satisfactory practice group ( $>$ median) turned out to be 51 (45.95%). It indicated that more than half of food handlers had unsatisfactory on food handling practice.

In Table 6, the proportion of up to 2-year working food handlers had unsatisfactory and satisfactory practices (65.71%vs34.29% respectively). However, 27(65.85%) of above 2-year working food handlers had satisfactory on food handling practices. There was statistically relationship between working duration in the current job of food handlers and their food handling practices status ( $X^2=10.37, P=.001$ ).

**Table 6. Association of the food handlers' practices**

Characteristics	Variables	Unsatisfactory Food handling Practices status	Satisfactory Food Handling Practices status	$X^2$ (P value)
Age (completed years)	18-30	44 (60.27)	29 (39.73)	3.32 (.07)
	>30	16 (42.11)	22 (57.89)	
Sex	Male	20 (62.50)	12 (37.50)	1.29 (.26)
	Female	40 (50.63)	39 (49.37)	
Education level	Up to primary school level	19 (45.24)	23 (54.76)	2.11 (.15)
	>primary school level	41 (59.42)	28 (40.58)	
Income (kyats)	<100,000	27 (62.79)	16 (37.21)	2.16 (.14)
	$\geq$ 100,000	33 (48.53)	35 (51.47)	
Rice & curry	Yes	32 (53.33)	28 (46.67)	.02 (.87)
	No	28 (54.90)	23 (45.10)	
Fruits	Yes	7 (53.85)	6 (46.15)	.0003 (.99)
	No	53 (54.08)	45 (45.92)	
Raw meat	Yes	13 (44.83)	16 (55.17)	1.35 (.25)
	No	47 (57.32)	35 (42.68)	
Raw vegetables	Yes	24 (46.15)	28 (53.85)	2.46
	No	36 (61.02)	23 (38.98)	
Cold drink	Yes	3 (50.00)	3 (50.00)	(1*)
	No	57 (54.29)	48 (45.71)	
Hot drink (tea, coffee)	Yes	16 (66.67)	8 (33.33)	1.96 (.16)
	No	44 (50.57)	43 (49.43)	
Food prepared before selling	Yes	17 (48.57)	18 (51.43)	.62 (.43)
	No	43 (56.58)	33 (43.42)	

Employment status	Employee	51 (55.43)	41 (44.57)	.41
	Family business person	9 (47.37)	10 (52.63)	(.52)
Duration of working in the current job	≤24 months	46 (65.71)	24 (34.29)	10.37
	>24 months	14 (34.15)	27 (65.85)	(.001)
Pre-employment Medical examination	Yes	0 (.00)	0 (.00)	
	No	60 (54.05)	51 (45.95)	
Regular Periodic Medical examination	Yes	0 (0.00)	0 (0.00)	
	No	60 (54.05)	51 (45.95)	
Food Safety training	Yes	1 (50.00)	1 (50.00)	(.1*)
	No	59 (54.13)	50 (45.87)	
Self-reported Health conditions	Feeling well	52 (52.00)	48 (48.00)	1.71
	Feeling unwell	8 (72.73)	3 (27.27)	(.19)

(\*=Fisher exact test)

#### 4. DISCUSSION

Regarding to age of food handlers, mean age was 29.41 years, and the majority (41%) of the food handlers was in age group of 21-30years. Similarly, majority of food handlers in Brazil (63%) were within age group 20-30years with mean age of 30 years [23], those working at food establishments around a rural teaching hospital in India (54.37%) were below 30year of age [6]. With respect to male and female distribution, (71.17%) were female showing that female were main persons in food handling. This finding was consistent with previous study in Malaysia where percentages of female food handlers were (69.5%) [24]. This may be due to culture of Asia that female play a key participation in food handling and food preparation. As regard to educational status of food handlers, up to primary school level was (37.84%) and this finding was nearly consistent with other studies where up to primary school level had reached (38.6%) and (47.49%) the food handlers respectively [21,6]. Due to low educational background of food handlers, they might be a little or no understanding of the risks of microbial or chemical contamination to food and ways to avoid it. Also similar fact was pointed out by Prabhu [25]. In addition to low educational level, only (1.80%) had attended food safety training courses, this means they might not be aware of food handling practices during food processing.

Therefore, health education about food handling practices and food safety should be given more and more. Concerning with monthly individual income, there was (38.74%) of the food handlers attained less than 100,000 kyats per month while minimum wages in Myanmar increased to 4800 kyats per day in 2018 from 3600 kyats per day in 2017 [26].

As regards to types of food, (54.05%) of food handlers handled rice and curry. With respect to working status of the food handlers, working hours ranged from 28 to 112 hours per week and food handlers were (82.88%) full-time employee. Similarly, (83%) were full-time institutional food handlers. Hence, full-time employee should be targeted to raise hygienic status and food handling practices [17]. The common duration of working was less than five years (above 80%) in the current study. But the common duration of working up to five years was found to be in the studies in Egypt (15%) and in Brazil (15%) [27,28]. Therefore in the current study, the duration of working in the current job was short and turnover rate may be frequent. New face food handlers might become the issue to consider getting proper food sanitation information, training and health education. It was found all food handlers (100%) got neither pre-employment nor regular periodic medical examinations. Similarly in Egypt, all of the food handlers in hospital (100%) not have periodic

examination [27]. Among Indian hospital food handlers, (89.5%) also did not get preplacement medical checkup and none of them received routine periodic medical checkups in the last one year [29]. Therefore, both pre-employment and regular periodic examination should be considered as mandatory in all settings including hospital setting. Regarding food safety training, (98.20%) of food handlers was not trained any food safety and food handling practice training. It was quite similar to other studies in which food safety training did not receive (85%), (83.3%) and (75%) of food handlers respectively [29,30,31]. Therefore, food safety and safe food handling practices training should be implemented to reduce the risk of food-borne diseases related to unhygienic practices of food handlers in hospital settings. In present study, (9.91%) had suffered feeling unwell and food handlers working during their illness might be a source of food-borne diseases. Among them, (63.63%) had sneezing/running nose, (27.27%) had cough only and (9.09%) had cough with sneezing/running nose. Therefore, health status and personal hygiene of food handlers should be given a priority. Moreover, periodic medical examination and restricting handling of food during illness should be done in the eating establishments.

In this study, positive results were obtained regarding handwashing practices before handling food, before and after touching unwrapped raw foods, after using toilet and after disposing rubbish. But handwashing practices of food handlers was quite low on many other occasions especially before handling utensils/equipment, before preparation of next customers, after touching body parts, after sneezing or coughing and after handling money. Microorganisms can be introduced during food processing by cross-contamination from any raw agricultural product or from infected humans handling the food. The practice of not washing hands in between handling of raw and cooked food greatly increase the chances of such cross contamination and this practice was reported in the majority. Moreover, limiting of food handling practices during illness should be considered all food handlers of eating establishments in hospital setting.

So as to achieve food safety in hospitals, all food handlers should have valid medical certificate. In addition, the majority of food handlers did not have to use the sanitation facilities such as gloves, caps, masks, aprons and dust bin with cover. Moreover, there has a strict rule of

prohibiting of wearing rings and hand chain, smoking, betel chewing and handling food with bare hands in their kitchens.

Regarding practice status in the current study, (54.05%) of food handlers were exercising unsatisfactory practice and (45.95%) in satisfactory practice. There was a study showed that food handlers had insufficient practice (49%) in Brazil [22]. In Myanmar, there were studies expressed as follow; low practice (50%) from school food handles in Thin Zar Thike (2012) study, unsatisfactory practice (45.9%) from restaurants in Nyein Aye Tun (2013) study and (44.4%) poor practice from school food handlers in Aung Nyan Min (2016) study. Therefore, food handlers' practice status also was still need to be improved.

In the present study, three fifth (60%) of up to 30-year age group has unsatisfactory practices. There was no statistically significant association between socio-demographic characteristics (age, sex, education level, and income) and food handling practices status among food handlers. But literacy level of food handlers is associated to personal hygiene practice [6,28]. Therefore, health education and training about food handling practices should be delivered to all food handlers before employment and checked regularly by the owners. In this study, one third (65%) of up to two-year working experiences has unsatisfactory food handling practices and there was an association between them ( $P=.001$ ). But there were no other associations between working characteristics (types of food, working hours per week, employment status, duration of working in the current job, pre-employment medical examination, regular periodic medical examination, food safety training and self-reported current health conditions) and food handling practices status among food handlers.

## 5. CONCLUSION

More than half of food handlers had unsatisfactory on food handling practices covering handwashing, food handling practices during their illness, personal hygiene, safe food handling practices and situations of working area of the food handlers. Therefore, this study highlighted that there was high in unsatisfactory food handling practice and there was statistically significant associations between duration of working and food handling practice.

## 6. RECOMMENDATION

1. The eating establishments' owners should check the health status of all food handlers before employment. Continuous monitoring and inspection to food handlers should be present. This can improve adherence of the food handlers to personal hygiene and food handling practices. They also should provide the sanitation facilities such as the gloves, caps, masks, aprons and dust bin with cover. Moreover, there has a strict rule of prohibiting of wearing rings and hand chain, smoking, betel chewing and handling food with bare hands in their kitchens. And they also should have a plan for omitting of food preparations during suffering illness.
2. Every food handlers should have to attain food handling practices training. Pre-employment training on personal and food hygiene, food handling practices and waste management utilities should be provided to all food handlers either by the eating establishments' owners or by the hospital eating establishment management committee or other bodies alike. Renewal of license and contract for the owners may be withheld if preplacement and periodic training and medical checkups are not done.
3. Hospital eating establishment management committee needs to direct more effort toward promoting the eating establishment standard. Standard checklists and guidelines for eating establishment should be implemented by hospital eating establishment committee in order to prevent food-borne diseases and in order to promote health status and food hygienic practices of the food handlers.
4. To attain safe food in hospitals, hospital authorities need to cooperate with other departments such as Mandalay City Development Committee, Food and Drug Administration and General Administration Department by monitoring of hygienic status of eating establishment around their hospital campus.

## ACKNOWLEDGEMENTS

My special thank also go to the Implementation Research Grant Committee (Implementation Research Grant ID 23), Department of Medical Research, Myanmar for partially funding this study.

## CONSENT

Written informed consent was obtained from the food handlers after full explanation of the study purpose to them and their rights as participants were provided by the interviewer.

## ETHICAL APPROVAL

Approval of this study was obtained from Research and Ethics Committee of the University of Medicine, Mandalay (UMM).

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. School of Exercise and Nutrition Sciences. Foods from Plants and Animals [Internet]. Better Health channel. 2012 [cited 2018 Dec 25]. Available: <https://www.betterhealth.vic.gov.au/443/health/healthyliving/foods-from-plants-and-animals>
2. El Sheikha AF. DNAFoil: Novel technology for the rapid detection of food adulteration. Trends in Food Science & Technology. DOI:10.1016/j.tifs.2018.11.012
3. EL SHEIKHA Aly, LEVIN Robert, XU Jianping (Principal Editor). Molecular techniques in food biology: Safety, biotechnology, authenticity & traceability. John Wiley & Sons Ltd., Chichester, UK. 2018; ISBN 978-1-1193-7460-2, pp. 472.
4. El Sheikha AF. Food safety issues in Saudi Arabia. Nutrition and Food Technology. 2015;1(1):1-4. DOI:10.16966/nftoa.103
5. WHO. Food safety [Internet]. World Health Organization. 2017 [cited 2018 Dec 24]. Available: <https://www.who.int/news-room/fact-sheets/detail/food-safety>
6. Mudey AB, Kesharwani N, Mudey GA, Goyal RC, Dawale AK, Wagh VV. Health status and personal hygiene among food handlers working at food establishment around a rural teaching hospital in Wardha District of Maharashtra, India. Global Journal of Health Science. 2010;2(2):198.
7. Assefa T, Tasew H, Wondafrash B, Beker J. Assessment of bacterial hand contamination and associated factors among food handlers working in the student cafeterias of Jimma Main Campus,

- Jimma, South West Ethiopia. *Journal of Community Medicine & Health Education*. 2015;5(2):1–8.
8. Boro P, Soyam VC, Anand T, Kishore J. Physical environment and hygiene status at food service establishments in a tertiary care medical college campus in Delhi: A cross-sectional study. *Asian Journal of Medical Sciences*. 2014;6(4):74–9.
  9. Shoko M, Sibanda N, Sibanda MM, Otieno-Ayayo Z. Factors contributing to bacterial diversity and load in Bulawayo restaurants, Zimbabwe. *Baraton Interdisciplinary Research Journal*. 2012;2(2):7–19.
  10. Lee HK, Abdul Halim H, Thong KL, Chai LC. Assessment of food safety knowledge, attitude, self-reported practices, and microbiological hand hygiene of food handlers. *Int J Environ Res Public Health*. 2017;14(55):1–14.
  11. Nay Soe Maung, Htin Zaw Soe, Aye MM, Lwin, Myint Myint, Cho Cho Oo CC, Myint Thein, et al. Raising food safety by food safety training program to street-food vendors in an Urban Area of Yangon. *Journal of Food, Nutrition and Dietetics*. 2017;2(1):113.
  12. El Sheikh AF, Xu J. Traceability as a key of seafood safety: Reassessment and possible applications. *Reviews in Fisheries Science & Aquaculture*. 2017;25(2):158–170. DOI:10.1080/23308249.2016.1254158
  13. El Sheikh AF. Traceability and inspection: For safer food supply. *Asia-Pacific Journal of Food Safety and Security (APJFSS)*. 2017;3(1):1-2.
  14. El Sheikh AF\*, Montet D. New strategies of traceability for determining the geographical origin of foodstuffs: Creation of a biological Bar-Code by PCR-DGGE. *News on TRACE*. Available:<http://trace.eu.org/admin/news/file/Article%20TRACE-Cirad-Jan2010.pdf>15. Oliveira AC de, Damasceno QS. Surfaces of the Hospital Environment as Possible Deposits of Resistant Bacteria: A Review. *Journal of School of Nursing, University of Sao Paulo*. 2010;44(4):1118–23.
  15. Oliveira AC de, Damasceno QS. Surfaces of the Hospital environment as possible deposits of resistant bacteria: A review. *Journal of School of Nursing, University of Sao Paulo*. 2010;44(4):1118–23.
  16. Lund BM, O'Brien SJ. The occurrence and prevention of foodborne disease in vulnerable people. *Foodborne Pathogens and Disease*. 2011;8(9):961–73.
  17. Akabanda F, Hlortsi EH, Owusu-Kwarteng J. Food safety knowledge, attitudes and practices of institutional food-handlers in Ghana. *BMC Public Health*. 2017;17(40):1–9.
  18. CDC. Foodborne Illnesses and Germs | Food Safety | Cdc [Internet]. 2018 [cited 2018 Dec 25]. Available:<https://www.cdc.gov/foodsafety/foodborne-germs.html>
  19. EFSA, ECDC. The European Union Summary Report on Trends and Sources of Zoonoses, Zoonotic Agents and Food-Borne Outbreaks in 2016. *EFSA Journal*. 2017;15(12):1–228.
  20. Ministry of Health. Health in Myanmar. [Internet]. Nay-pyi-taw, the Republic of the Union of Myanmar: Ministry of Health; 2014 [cited 2018 Dec 25]. Available: <http://mohs.gov.mm/Main/content/publication/health-in-myanmar-2014>
  21. Kasturwar NB MS. Knowledge, practices and prevalence of *Mrsa* among food handlers. *International Journal of Biomedical and Medical Research*. 2011;2(4):889–94.
  22. WHO. Five Keys to Safer Food Manual. First Edition. Geneva, Switzerland: WHO Department of Food Safety, Zoonoses and Foodborne Diseases; 2006.
  23. Jf F, Dlms C. Food Handlers? Occupational and professional training characterization. *Journal of Nutrition & Food Sciences* [Internet]. 2014 [cited 2018 Oct 4];04(06). Available:<https://www.omicsonline.org/open-access/food-handlers-occupational-and-professional-training-characterization-2155-9600.1000325.php?aid=32538>
  24. Mohd Zain M, Naing NN. Sociodemographic characteristics of food handlers and their knowledge, attitude and practice towards food sanitation: A preliminary report. *The Southeast Asian journal of tropical medicine and public health*. 2002;33(2):410–7.
  25. Prabhu P. A study of food handlers in public food establishments in Maharashtra, India. *International Journal of Science and Research (IJSR)*. 2014 Jul 31;3(7):1485–9.
  26. Plus L. New Minimum Wage for Employees in Myanmar [Internet]. LawPlus Ltd. 2018 [cited 2018 Dec 25]. Available:<https://www.lawplusltd.com/2018/02/new-minimum-wage-employees-myanmar/>
  27. Saad DAM, Mahmoud DF, Mahmoud DBH. Training program among hospital food

- handlers' regarding food borne diseases. IOSR Journal of Nursing and Health Science (IOSR-JNHS). 2018;7(4):1–11.
28. Soares LS, Almeida RCC, Cerqueira ES, Carvalho JS, Nunes IL. Knowledge, attitudes and practices in food safety and the presence of coagulase-positive staphylococci on hands of food handlers in the schools of Camaçari, Brazil. Food Control. 2012;27(1):206–13.
29. Mukhopadhyay P, Joardar GK, Bag K, Samanta A, Sain S, Koley S. Identifying key risk behaviors regarding personal hygiene and food safety practices of food handlers working in eating establishments located within a hospital campus in Kolkata. Al Ame En J Med Sci. 2012;5(1):21–8.
30. Allam H, Al-Batanony M, Seif A, Awad E. Hand contamination among food handlers. British Microbiology Research Journal. 2016;13(5):1–8.
31. Sithole Z, Juru T, Chonzi P, Bangure D, Shambira G, Gombe NT, et al. Food borne illness amongst health care workers, at a Central Hospital, Harare, Zimbabwe, 2016: A Retrospective Cohort Study. BMC Res Notes. 2017;10(715):1–6.

© 2019 Aung et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*

*The peer review history for this paper can be accessed here:*  
<http://www.sdiarticle3.com/review-history/47380>