



UNIVERSITI PUTRA MALAYSIA

***PERSONAL HYGIENE ASSESSMENT AND AWARENESS OF
RESTAURANT FOOD HANDLERS IN AMPANG (SELANGOR,
MALAYSIA)***

ABYAN HAZIMAH BINTI KAMALUDIN

**Ip
FPSK4 2019 10**

**PERSONAL HYGIENE ASSESSMENT AND AWARENESS OF
RESTAURANT FOOD HANDLERS IN AMPANG (SELANGOR, MALAYSIA)**

BY

ABYAN HAZIMAH BINTI KAMALUDIN

**Thesis submitted in fulfilment of the requirement for the degree of Bachelor
Science (Environmental and Occupational Health) from the Faculty of Medicine
and Health Sciences, Universiti Putra Malaysia.**

ACKNOWLEDGEMENTS

First and foremost, Alhamdulillah I praise to the Almighty Allah for all His blessings for giving me strength and good physical and mental health throughout the duration of this study. I would like to express my gratitude to my supervisor, Assoc. Prof. Dr Sarva Mangala Praveena for her patience, understanding, expertise and endless support in guiding and helping me throughout the journey of this research. A special thanks to my co-supervisor, Assoc. Prof. Dr Imiza Rasdi for her encouragement and support.

Besides that, I would like to express my sincere thanks to the management of Ampang Jaya Municipal Council for giving approvals and also to all the staffs for their support during the sampling. Special appreciation also goes to all respondents for their willingness to participate in this study. Without their help and cooperation, this study would not successful.

Last but not least, I would like to deeply thanks to my family especially my parents, Kamaludin Bin Supian and Rosnah Binti Tumin for their full support, encouragement and prayer throughout this challenging journey. I would also like to thank my friends, Maizatul Zahirah Binti Mohd Rashid, Khairunnisa Binti Kasmuni, Nur Syafiqah binti Hanapi and Muhamad Safwan Bin Supian for their encouragement and help during ups and down in this whole process. To those who indirectly contributed in this research, your kindness means a lot to me. Thank you very much.

ABSTRACT

PERSONAL HYGIENE ASSESSMENT AND AWARENESS OF RESTAURANT FOOD HANDLERS IN AMPANG (SELANGOR, MALAYSIA)

ABYAN HAZIMAH BINTI KAMALUDIN

Introduction: Food handlers' malpractices are reported as the main source of foodborne outbreaks during food preparation for public consumption in food services. Food handlers are in charged in serving safe food for public customers. The key factor of foodborne disease is the microbiology hazard. **Objective:** To understand the bacterial contamination (*Salmonella Typhi*, *Shigella species* and *Escherichia coli*) and personal hygiene awareness levels (knowledge, attitude and practice) among restaurant food handlers in Ampang (Selangor, Malaysia). **Methods:** This cross sectional study was conducted among 114 restaurants food handlers in Ampang, Selangor using simple random sampling method. Questionnaire was used to assess the personal hygiene awareness level (knowledge, attitude and practice) and hand swabbing was conducted to assess bacterial contaminant (*Salmonella Typhi*, *Shigella species* and *E. coli*) in restaurant food handlers' hand. **Result and discussion:** The restaurant food handlers in Ampang (Selangor) have good knowledge level (87.6%) of personal hygiene and moderate level for attitude (76.2%) and practice (76.6%) part. However, the total awareness level (knowledge, attitude and practice) were not directly indicate the bacterial occurrence on food handlers' hands as there were the presence of bacteria with *Shigella* (81.6%) was the highest followed by *E.coli* (34.2%) and *Salmonella* (14.9%). The study also revealed that there were no significant differences between the awareness level with bacterial (*Shigella* and *Salmonella*) occurrence in restaurant food handlers. However, there was significant association between the knowledge level of food handlers and *E.coli* in restaurant food handlers' hands. **Conclusion:** The importance of the personal hygiene should be emphasized by every food handlers and also the monitoring authorities of the food premises. It could help in increasing the hygiene level of the restaurant, and reduce the risk of bacteria transmission on food for consumers.

Keywords: hand swabbing, personal hygiene, restaurant food handlers

ABSTRAK

PENILAIAN DAN KESEDARAN KEBERSIHAN PERIBADI PENGENDALI MAKANAN RESTORAN DI AMPANG (SELANGOR, MALAYSIA)

ABYAN HAZIMAH BINTI KAMALUDIN

Pengenalan: Salah pengendalian pengendali makanan dilaporkan sebagai sumber utama wabak penyakit bawaan makanan semasa penyediaan makanan untuk orang awam dalam perkhidmatan makanan. Pengendali makanan bertaanggungjawab untuk menyediakan makanan yang selamat kepada pelanggan. Faktor utama penyakit bawaan makanan adalah bahaya mikrobiologi. **Objektif:** Untuk memahami pencemaran bakteria (*Salmonella Typhi*, spesies *Shigella* dan *Escherichia coli*) dan tahap kesedaran kebersihan diri (pengetahuan, sikap dan amalan) di kalangan pengendali makanan di Ampang (Selangor, Malaysia). **Metodologi:** Kajian keratan rentas ini dijalankan di antara 114 pengendali makanan restoran di Ampang, Selangor menggunakan kaedah pensampelan rawak mudah. Borang soal selidik digunakan untuk menilai tahap kesedaran kebersihan diri (pengetahuan, sikap dan amalan) dan kaedah mengelap tangan telah dijalankan untuk menilai pencemaran bakteria (*Salmonella Typhi*, spesies *Shigella* dan *E. coli*) di tangan pengendali makanan restoran. **Keputusan dan Perbincangan:** Pengendali makanan restoran di Ampang (Selangor) mempunyai tahap pengetahuan kebersihan diri yang baik (87.6%) dan tahap sederhana untuk bahagian sikap (76.2%) dan amalan (76.6%). Walau bagaimanapun, keseluruhan tahap kesedaran kebersihan diri (pengetahuan, sikap dan amalan) tidak langsung menunjukkan kewujudan bakteria pada tangan pengendali makanan kerana terdapat kehadiran bakteria dengan *Shigella* (81.6%) adalah yang tertinggi diikuti oleh *E.coli* (34.2%) dan *Salmonella* (14.9%). Kajian itu juga mendedahkan bahawa tidak terdapat perbezaan yang signifikan antara tahap kesedaran dengan kejadian bakteria (*Shigella* dan *Salmonella*) di pengendali makanan restoran. Walau bagaimanapun, terdapat hubungan yang signifikan antara tahap pengetahuan pengendali makanan dan *E.coli* di tangan pengendali makanan restoran di Ampang, Selangor. **Kesimpulan:** Kepentingan kebersihan diri harus ditekankan oleh setiap pengendali makanan dan juga pihak pemantau premis makanan. Hal ini boleh membantu meningkatkan tahap kebersihan restoran, dan mengurangkan risiko penularan bakteria pada makanan untuk pengguna.

Kata kunci: mengelap tangan, kebersihan diri, pengendali makanan restoran

TABLE OF CONTENTS

	Page
DECLARATION	ii
SIGNATURE OF SUPEVISOR/ INTERNAL EXAMINER	iii
ACKNOWLEDGEMENT	v
ABSTRACT	vi
ABSTRAK	vii
CONTENTS	x
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF ABBREVIATIONS	xiii
CHAPTER 1: INTRODUCTION	
1.1 Background	1
1.2 Problem Statement	3
1.3 Study Justification	6
1.4 Objective	7
1.5 Hypothesis	7
1.6 Definition of Term	8
1.7 Conceptual Framework	10
CHAPTER 2: LITERATURE REVIEW	
2.1 Food Handlers in Restaurant	11
2.2 Food Contaminant	13
2.3 Foodborne Disease	14
2.4 Roles of agencies in Malaysia food industry	16
2.5 Awareness level of personal hygiene among food handlers	17

CHAPTER 3: METHDOLOGY

3.1	Study Design	22
3.2	Study Location	22
3.3	Sampling Method	25
	3.3.1 Restaurant	25
	3.3.2 Food Handlers	25
3.4	Sample size determination	26
3.5	Study Population	29
3.6	Data collection technique and instrumentation	28
	3.6.1 Questionnaires	30
	3.6.2 Bacterial Contaminants Assessment	32
3.7	Research flow	34
3.8	Data analysis	36

CHAPTER 4: RESULTS

4.1	Food handlers & restaurant status in Ampang	37
4.2	Bacteria occurrence presence in food handlers	42
4.3	Awareness level of restaurant food handlers in Ampang (Selangor)	43
	4.3.1 Knowledge level of restaurant food handlers	43
	4.3.2 Attitude level of restaurant food handlers	46
	4.3.3 Practice level of restaurant food handlers	48
4.4	Association between bacterial contamination (Shigella species, Salmonella and E. coli) and personal hygiene awareness level (knowledge, attitude and practice) among restaurant food handlers in Ampang, Malaysia	51

CHAPTER 5: DISCUSSION

5.1	Restaurant hygiene status in Ampang	53
5.2	Bacteria occurrence presence in food handlers	54
5.3	Awareness level of restaurant food handlers in Ampang (Selangor)	56
	5.3.1 Knowledge level of restaurant food handlers	56
	5.3.2 Attitude level of restaurant food handlers	57

5.3.3 Practice level of restaurant food handlers	58
5.4 Association between bacterial contamination (Shigella species, Salmonella and E. coli) and personal hygiene awareness level (knowledge, attitude and practice) among restaurant food handlers in Ampang, Malaysia	59
CHAPTER 6: CONCLUSION AND RECOMMENDATION	
6.1 Conclusion	61
6.2 Recommendation	62
REFERENCES	63
APPENDICES	
I The ethical approval letter	72
II Participant Information Sheet and Informed Consent Form	75
III Questionnaire	82
IV The observational checklist	96
V The flowchart of study	98
VI The result of bacterial contaminants assessment	100

LIST OF TABLES

		Page
Table 1.1	The previous studies on the food handlers	19
Table 3.1	The sample size calculation based on each specific objective	27
Table 3.2	Statistical analysis for each specific objective	36
Table 4.1	Socio-demographic of restaurant food handlers (n = 114).	38
Table 4.2	The association between bacterial contamination (<i>Shigella species</i> , <i>Salmonella</i> and <i>E. coli</i>) and personal hygiene awareness level (knowledge, attitude and practice) among restaurant food handlers in Ampang, Malaysia.	53

LIST OF FIGURES

		Page
Figure 1.1	Conceptual framework of this study	10
Figure 2.1	The roles of government agencies in Malaysia	17
Figure 3.1	Maps of study location	24
Figure 3.2	The flowchart of study	35
Figure 4.1	Grade premises for restaurants in this study	41
Figure 4.2	Bacteria occurrence presence in food handlers (n = 114)	42
Figure 4.3	Food handlers' knowledge related to personal hygiene (n = 114)	45
Figure 4.4	Food handlers' attitude related to personal hygiene (n = 114)	48
Figure 4.5	Food handlers' practice related to personal hygiene (n = 114)	51

LIST OF ABBREVIATIONS

WHO	World Health Organisation
XLD	Xylose Lysine Deoxycholate
EMB	Eosin Methylene Blue
<i>E. coli</i>	<i>Escherichia coli</i>
<i>Salmonella</i>	<i>Salmonella Typhi</i>
<i>Shigella</i>	<i>Shigella species</i>
MOH	Ministry of Health Malaysia
<i>V. cholera</i>	<i>Vibrio cholera</i>
FAO	Food and Agriculture Organization
CFU	colony-forming unit

CHAPTER 1

INTRODUCTION

1.1 Background

Foodborne outbreaks are reported related to food handlers' malpractice during food preparation for public consumption in food services. Food handlers are persons who have direct engagement in the process of food handling, from the preparation to the serving food. Food handlers are dependable in giving safe food to the admission of their customers (Martins, Hogg, and Otero, 2012). Hands of food handlers have been shown to be vectors in the spread of foodborne disease, primarily due to poor personal hygiene and contributing 97% of foodborne diseases in food service establishments and homes (Lambrechts et al, 2014).

In 2015, Ministry of Malaysia Health reported that food poisoning has been the most decisive factor in food and waterborne diseases, contributing to over 47.3 incident rates per 100,000 Malaysian populations, accompanied by typhoid, cholera, dysentery and hepatitis A, alarming for more intervention (Department of Statistic, 2016). In the Malaysian food industry, foodborne diseases have been identified as being caused by microbiological hazards. Sharifa Ezat et al (2013) mentioned in their study that unhygienic food handling practices are the most common factor in foodborne disease outbreaks. Food-related practices refer to the food handlers

hygiene status or cleanliness. This can be reflected by wearing clean clothes and aprons, short and clean hair, fingernails and shoes while handling food in the premises. This was also supported by Abdul Mutalib et al (2015) that stated the increase in food poisoning cases may demonstrate that food handlers have neglected the significance of sustainable food handling in the kitchen.

Contamination refers to a situation that due to the presence of undesirable elements is improper for use. Food contamination may happen because of the presence of foreign voids in the food, such as chemicals, physical, and microbes. It is necessary and obviously not obnoxious to have microbes in certain foods. Contamination of foods with microbiology can be explained more precisely as some unwanted bacteria are present in a food. *Pseudomonas*, *Listeria monocytogenes*, *Salmonella sp.*, *Shigella flexneri*, *Vibrio cholerae*, *Bacillus sp.*, and *Campylobacter jejuni*, and *Escherichia coli* are common microbial contaminants (MyHealth, 2015). Microbiological contaminants pose a major threat to the food industry as most bacteria can develop biofilms in the existence of even tiny amounts of moisture and nutrients (Lopez et al., 2018).

Personal hygiene of food handler is a basic preventive way of protecting toward disease spread and prevents bacterial transmission. It has been founded that after a visit to the toilet, unwashed hands of a food handler can transmit microorganisms, particularly faecal pathogens, to food products (Lambrechts et al, 2013). Research into outbreaks of foodborne disease showed that poor personal hygiene, mainly inefficient hand washing, is a major contributing factor to foodborne

disease (Huy et al., 2016 & Tan et al, 2013). According to Malaysia Food Regulations it does not provide for maximum counts related to *E. coli*, *Salmonella* and *Shigella* on food handlers but the bacteria must be absent in all food products (Lambrechts et al, 2014). However, based on Tan et al. (2013), *E. coli* count threshold in person is >10 CFU/cm².

1.2 Problem Statement

In Malaysia, food poisoning incidence rate (IR) was the highest in 2015 at 47.3 per 100,000 populations (Department of Statistic, 2016). Mutalib et al., (2014) stated that the lack of self-hygiene food handlers is one of the factors identified to contribute to food poisoning. This is supported by Linscott et al (2011) and Compas et al (2009) mentioned that food handlers are a key cause of contamination since they can spread hazardous organisms by skin or fecal-oral lesions. Due to the changing lifestyle especially in urban area, more people tend to eat outside their convenience and indirectly exposed them to unhygienic restaurant. Most of food handlers aware with the food safety but they still not incorporated into practical work (Hajdinjak & Jevsnik, 2008). The fact that an increase of urban population exponential by the rising living standard and demand causing the food handlers focus on preparing delicious and quick foods and ignoring the restaurant hygiene status. The trend of eating-out in the restaurant has health implications whenever it lands the consumer to eat at unclean premises and cause health issues (Noraziah et al, 2012). However, information on the hygiene status of restaurants in urban area is scant.

Food handlers are potential sources of microorganisms that cause illness and food spoilage. Personal hygiene of food handler is a basic preventive way of protecting toward disease spread and prevents bacterial transmission (Lambrechts et al, 2013). Personal hygiene or cleanliness of food handler gives big significance because this group of people has particular responsibilities related to preparing safe food to customer (Mohd Firdaus et al, 2015). Personal hygiene is often the cause of many food poisoning cases (Unilever Food Solution, 2019). Good personal hygiene such as wash hands properly, wear clean clothes, keep fingernails short and avoid handle food when feel unwell can prevent food poisoning (Tan et al, 2013). Contaminated hands can spread bacteria around a kitchen very quickly. However there were still lacks of information on personal hygiene of restaurant food handlers in urban area in Malaysia.

Many previous studies on the level of knowledge, attitudes and practices of food handlers in Malaysia have been carried out (Norrakiah et al., 2014 & Noor Azira et al., 2012). Those other previous research focused only on ways to increase food handlers' awareness level. Microbiological contaminants can be transferred by the hand of the food handler from individual to individual or from individual to food contact surfaces (Lambrechts et al, 2013). Thus, food handlers are the major cause of contamination. However, limited local studies had analysed the bacterial contaminants on food handlers' hands. Bacteria such as *Salmonella Typhi*, *Shigella* and *Escherichia coli* can survive hours or even days after initial contact with the microorganisms on hands and surfaces (MyHealth, 2015). These microbes have already been correlated with foodborne disease for years, causing diseases and even death to many people every year, enormous economic costs and human pain

(Bassyouni et al., 2012). Although there were studies on food handlers' hand, the previous studies (Huy key et al., 2016 & Allam et al., 2016) only focused in canteens in university campus and hospital kitchen. Information on bacterial contamination among urban restaurant food handlers is still inadequate.



1.3 Study Justification

This study will be able to update information on personal hygiene of restaurant food handlers. Personal hygiene among restaurant food handlers are important because it is the responsibility of food handlers to provide safe food for their customers (Martins, Hogg, and Otero, 2012). Food handlers must follow and understand basic food protection practices and maintain a high level of personal cleanliness and good sanitation practices to avoid contamination of food (MOH, 2010).

Findings from this study will provide more information on the bacterial contaminant (*Salmonella Typhi*, *Shigella species* and *Escherichia coli*) in restaurant food handlers together with personal hygiene awareness levels. By understanding this personal hygiene through bacterial contaminant *Salmonella Typhi*, *Shigella species* and *Escherichia coli*) and awareness levels, specific programme on personal hygiene of restaurant food handlers can be developed. This is because specific bacterial contaminants information and awareness levels of restaurant food handlers will help the food handlers to understand and practicing the good personal hygiene while involve in food preparation in order for the safety of food for public consumer.

1.4 Objective

General objective

1. To understand the bacterial contamination and personal hygiene awareness levels (knowledge, attitude and practice) among restaurant food handlers in Ampang (Selangor, Malaysia).

Specific objectives

1. To analyse the occurrence of bacteria (*Salmonella Typhi*, *Shigella species* and *Escherichia coli*) presence in food handlers' hands in Ampang, Malaysia.
2. To assess personal hygiene awareness levels (knowledge, attitude and practice) among restaurant food handlers in Ampang, Malaysia.
3. To assess the association between bacterial contamination (*Salmonella Typhi*, *Shigella species* and *Escherichia coli*) and personal hygiene awareness level (knowledge, attitude and practice) among restaurant food handlers in Ampang, Malaysia.

1.5 Hypothesis

There is significant association between the bacterial contamination and personal hygiene awareness levels (knowledge, attitude and practice) among restaurant food handlers in Ampang (Selangor, Malaysia).

1.6 Definition of Term

1.6.1 Conceptual Definition

a) Personal Hygiene

Personal hygiene refers to maintaining cleanliness of one's body and clothing to preserve overall health and well-being. It includes a number of different activities related to the following general areas of self-care: washing or bathing, including cleansing oneself after using the toilet; taking proper care of the mouth; grooming and dressing; and keeping clothing clean (The Gale Encyclopedia of Senior Health, 2018)

b) Food Handler

Food handler includes any person who (a) is directly involve in the preparation of food, (b) comes into contact with food or food contact surfaces; and (c) handles packaged or unpackaged food, or appliances, in any food premises (Food Hygiene Regulations, 2009).

c) Bacterial Hand Contamination

Bacterial contamination is when the hands becomes contaminated by bacteria and may transfer the bacteria to the food. Bacterial

contamination is the most significant in terms of microbial food poisoning and foodborne illnesses.

1.6.2 Operational Definition

a) Personal Hygiene

Personal hygiene refers to those protection measures with the responsibility of the food handlers, which promote and limit the spread of foodborne disease, like hand washing using soap and water, short finger nails etc.

b) Food Handler

Food handler who works in restaurants located in Ampang (Selangor, Malaysia).

c) Bacterial Hand Contamination

Presence of bacteria *Salmonella Typhi*, *Shigella species* and *Escherichia coli* on the hands of food handlers.

1.7 Conceptual Framework

Figure illustrates the conceptual framework for this study that highlights the independent and dependent variable. The study was conducted in restaurants among food handlers based on the conceptual framework (Figure 1.1). The independent variable of this study was food handlers' personal hygiene awareness (knowledge attitude and practice) and bacterial contamination was the dependent variable.

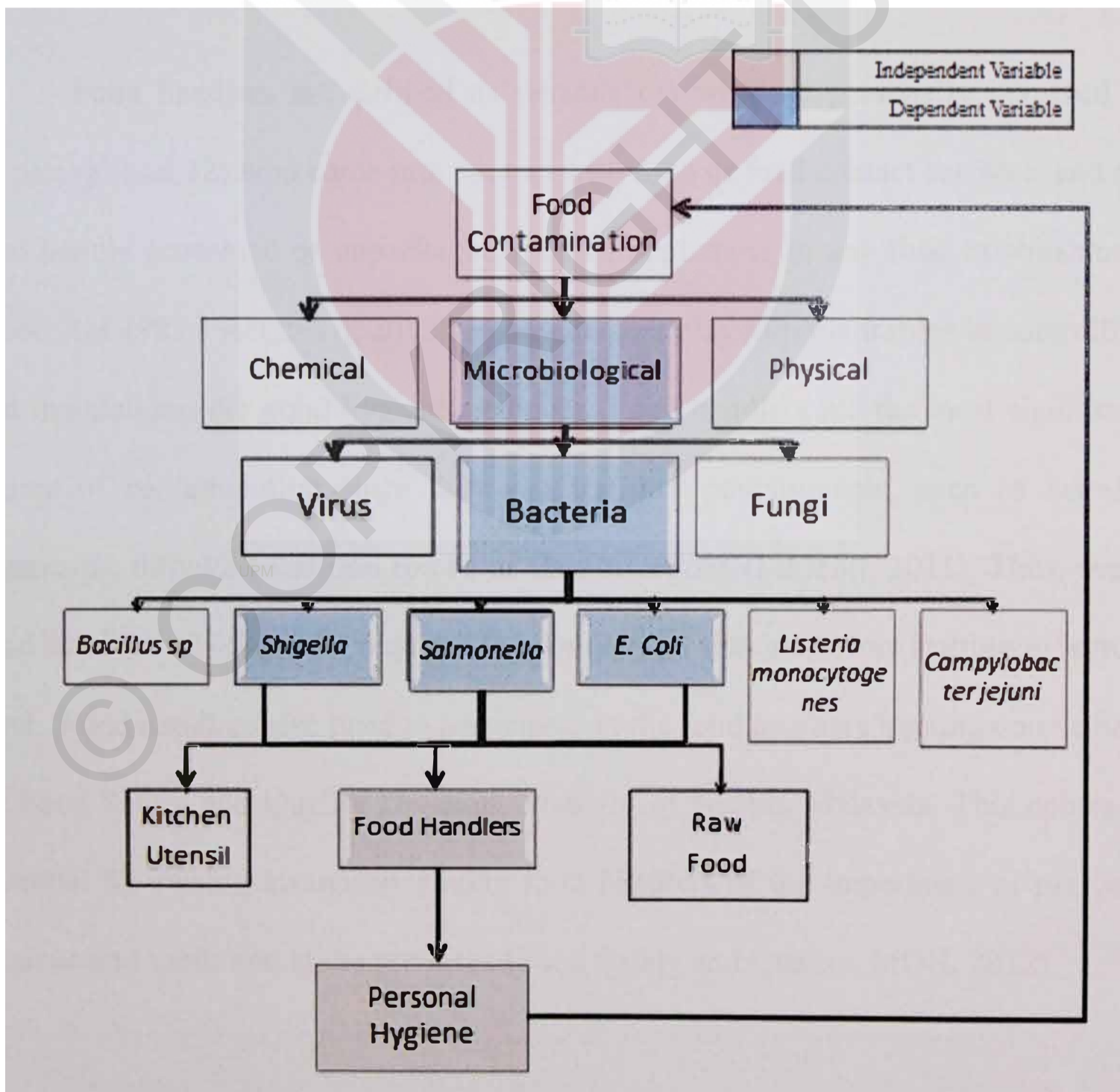


Figure 1.1 Conceptual framework of this study

CHAPTER 2

LITERATURE REVIEW

2.1 Food Handlers in Restaurant

Food handlers are defined as persons (1) who are personally involved in preparing food, (2) who come into contact with food or food contact surfaces, and (3) who handle processed or unpackaged food or appliances in any food establishment (Food Act 1983 [Act 281], 2012). Food handlers play important roles in controlling and maintaining the good hygiene practices. Food handlers are the most significant source of contamination since they can transmit contaminants, such as harmful organisms, through fecal-oral routes or skin infections (Linscott, 2011). Thus, every food handler in Malaysia is required to take typhoid vaccine before starting to handle food. Food handlers also need to participate in the food handlers training course held by Food Safety and Quality Division, Ministry of Health, Malaysia. This course is essential for raising awareness among food handlers of the importance of personal hygiene and sanitation at the premises (Food Safety and Quality, MOH, 2012).

The increase demand for food consumption from various food restaurants had cause the increase number of food handlers (Noraziah & Mohd Azlan, 2012). In

Malaysia, there were 167,490 food and beverage establishments operating in 2015 compared to 130,570 in 2010 with an annual growth rate of 5.1 percent (Department of Statistic Malaysia, 2017). Furthermore, the number of people involved in food and drink services is also increasing from 645.743 in 2010 to 891.616 in 2015 (Department of Statistic Malaysia 2017). In addition, Immigration Department (2017) also reported that there 71,515 foreign workers legally employed in Malaysia's restaurant sector. This shows that the eating lifestyle of people have changed from eating home to eating outside and indirectly cause the increase number of food handlers in Malaysia. Unfortunately, there has also been an upward trend in cases of food poisoning with more than half of the food handling linked to insanitary practice (Ministry of Health Malaysia, 2016).

In-house and on their hands, skin and hair, food handlers can carry pathogens. Food handlers must follow and understand basic food protection practices and maintain a high level of personal cleanliness and good sanitation practices to prevent contamination of food products (Lucey et al., 2006). Food hygiene law requires all food handlers to have a high standard of personal hygiene, to wear protective clothing and to follow the rules of food hygiene. In Malaysia, all food handlers must attend and complete the safe food handling course established by the Malaysian government under the Food Act 1983, and they must be vaccinated against typhoid as this disease is endemic in Malaysia. The evaluation and inspection of food premises is carried out by the District Health Office Local Authorities. However, most of food handlers fail to comply with this regulation and practices, may directly introducing pathogens that cause illness and death to consumer (Abdul Mutalib et al., 2015).

2.2 Food Contaminant

Contaminants are any unwanted components which have not been consciously added to food that can lead consumer disease. According to Malaysian Food Regulations 1985, contaminants are known as 'incidental constituent' which means any foreign, extraneous, toxic, noxious or harmful substances that is contained or present in or on the any food and includes metal contaminant, microorganisms and their toxins, drug residue and pesticide residue but does not include preservative, colouring substance, flavouring substance or any other substance permitted to be added to food (Santacruz, 2016). There are three types of food contaminants which are physical, chemical and microbiological contaminant. Physical contaminants refer to any contaminant in a food that can cause injury or illness to a person taking the item such as glass, needles or wood while chemical contaminants can occur through environmental pollution, use of different agrochemicals, food processing, chemical migration from food packaging or, of course, food (MyHealth, 2016). Microbiological food contaminant is either an organism or a substance such as virus, bacteria and fungi that an organism produces and can cause foodborne disease generally result from mishandling, preparation, or storage of food as well as contamination of the environment. A pathogenic microorganism can cause disease and lead to serious health issues (Schweihofer & Sarah, 2013).

In a research of personal hygiene measures, Michaels et al. (2004) outlined 15 microorganism outbreaks associated with contaminated food handlers, including: *Caliciviruses*(norovirus), *Salmonella spp.*, *hepatitis A*, *Shigella spp.*, *Staphylococcus*

aureus, *Streptococcus pyogenes*, *Salmonella typhi/paratyphi*, *Vibrio cholera 01*, *Yersinia enterocolitica*, *Giardia lamblia*, *Campylobacter jejuni*, *Cryptosporidium parvum*, *Escherichia coli O157:H7*, *Cyclospora cayetanensis*, and *Entamoeba histolytica*. Center Disease Control and Prevention (CDC, 2017) states that bacterial pathogens such as *Salmonella Typhi*, *Shigella species* and *Escherichia coli* often cause disease after multiplying bacteria in food upon being kept at incorrect temperatures to allow infectious dose to multiply.

2.3 Foodborne Diseases

The outbreak of foodborne disease is defined as two or more cases of similar disease due to food consumption (Soon et al., 2011). Foodborne diseases are responsible for the majority of mortality and morbidity worldwide, with up to 30% of the population in foodborne countries annually (WHO, 2014). More than 250 different foodborne diseases account for the consumption of food and water contaminated with potential foodborne pathogens such as bacteria, viruses, parasites and toxins (Linscott, 2011 & WHO, 2014). Bacteria, viruses and parasites can cause foodborne disease. Most foodborne diseases such as cholera, typhoid fever, hepatitis A, dysentery and food poisoning have acute gastrointestinal symptoms such as diarrhea and vomiting (WHO, 2014).

Cholera is usually a foodborne disease caused by *Vibrio cholera* infection in the intestinal tract. The symptoms such as acute severe watery diarrhoea occasionally

accompanied with vomiting. It is easy to isolate *V. cholera* from seafood such as cockles and oysters (Abdul Mutaib et al., 2015). Typhoid fever is a disease caused by *Salmonella Typhi* bacteria. (Yanagi et al., 2009) and the symptoms of disease include fever with an increased body temperature of 39 ° C to 40 ° C, headache, appetite loss, and stomach ache. Typhoid fever can spread fast from contaminated water and food or from infected individuals or carriers (Parry & Beeching, 2009).

Hepatitis is a liver-influencing disease. It is caused by a hepatitis A virus (HAV) that can be transmitted through contaminated food and beverage. Symptoms of disease include jaundice, dark urine, eating disorders, discomfort and extreme tiredness (Sharifa Ezat et al., 2013). Dysentery is an infection that leads to serious diarrhea containing mucus and/or blood in the feces, vomiting blood, or death if no treatment is given. Example of organisms causing dysentery is *Entamoeba histolytica*, a pathogen that causes dysentery (Abdul Mutalib et al., 2015) and *Shigella dysenteriae* causing dysentery in the bacillus (WHO, 2014). Some of the factors identified were unhygienic food handling practices, the use of contaminated water and poor environmental sanitation (MOH, 2012; Siow & Norrakiah, 2011).

A study of food services in many countries discovered that the public faces a major health challenge from raw and undercooked foods, infected food handlers and insufficient hygiene measures in the storage and processing of such foods (WHO, 2015). The presence of any signs or symptoms of foodborne disease (diarrhea, vomiting, open skin sores, boils, fever, dark urine, or jaundice) in the person handling the food may imply infection of bacteria from the people handling the food

may be transferred to others by handling the food production. In certain situations, the failure of food handlers to wash their hands (after using the toilet, handling raw meat, cleaning spills or carrying garbage), wear clean disposable gloves or using clean utensils is responsible for the transmission of these pathogens through hands to other individuals.

2.4 Roles of agencies in Malaysia food industry

Malaysia has come to realize that food safety can no longer be tolerated as a national organization alone, nor can it be a single agency's responsibility. Although the Ministry of Health has a mandate for food safety, other agencies are also accountable for safety and quality of food in the country (FAO, 2004). The legislation on food safety and quality in Malaysia is being gradually updated to meet the specific needs of consumers and food producers (Rentokil, n.d.). Many ministries and agencies participate in the food safety process, such as the Ministry of Health, the Ministry of Agriculture, local authorities and Customs. Food Safety and Nutrition Council was established in 2001, which serves as the government's highest advisory body on food safety. It is represented of agencies from the government and NGOs. This shows that both the government knows the value of food safety and acknowledges the gap in achieving it that still exists. Food safety is a national security issue and public health for a nation that exports seafood and fruit throughout the world, while also depending on imported basic food (Rosnani et al., 2014).

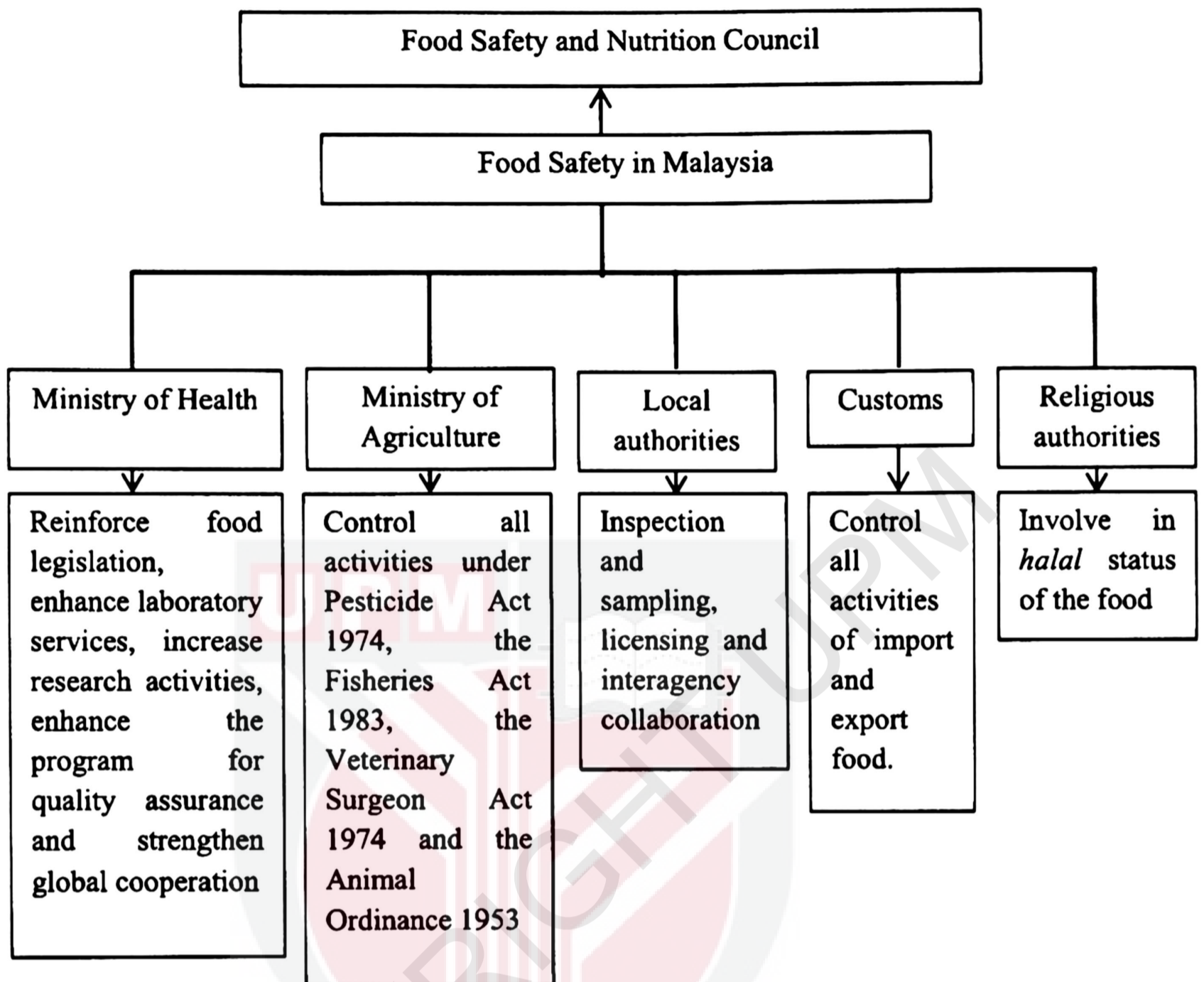


Figure 2.1: The roles of agencies in Malaysia

2.5 Awareness level of personal hygiene among food handlers

Many researches had been done all over the world in improving the food safety especially in personal hygiene among food handlers. Various studies have emphasised the need for training and education of food handlers due to lack of knowledge on microbiological food hazards, appropriate food storage temperatures

(less than 4 ° C), cross contamination risks and the importance of personal hygiene (Norrakiah et al., 2014, Abdul Mutalib et al., 2009 & Woh et al., 2016). These evaluations were focused on the KAP strategy, since knowledge (K) is claimed to be the major contributor influencing the practice (P) of an individual and the data will bring about a change in attitude (A) and subsequently a change in behaviour (Woh et al., 2016).

Previous study by Naser et al (2016) found that most food handlers in Saudi Arabia have good food safety knowledge with satisfied attitudes, good personal hygiene practices. Aisha et al (2015) stated that the performance of food handlers in hand swabbing after the food training intervention program has been improved positively. Other studies by Who et al (2016) on migrant food handlers in Peninsula Malaysia have revealed that the food handlers had poor food safety knowledge with average knowledge of food handling practices. Three main factors associated with the poor acquisition of knowledge included poor involvement in food training courses, low levels of education and language barriers.

Table 1.1: The previous studies on the food handlers

Author	Findings	Country
Nasser Abdulatif Al-Shabib, Sameh Hassan Mosilhey & Fohad Mabood Husain (2016)	Most of the workers belonging to different nationalities have good knowledge related to food safety, had excellent practices towards food and personal hygiene. Food handlers attitudes were favourable.	Saudi Arabia
Nora A. Moreb, Anushree Priyadarshini & Amit K .Jaiswala (2017)	The residents overall had an average level on knowledge of food safety practices. They had an average level of knowledge in food storage and personal hygiene. Conversely, they had a critically low level of knowledge in food handling and food poisoning. The results of the present study also showed that, the level of knowledge of food safety practices varies amongst the residents based upon their gender, age, place of residence, education level, and marital status.	Ireland

<p>Aisha M. Abushelaibi, Baboucarr Jobe, Hanan S.Afifi, Bahaa- Elden Mostafa Asia A. Murad & Abdulwahed K.Mohammed (2015)</p>	<p>Other than questionnaires and observable practices, hand and cutting board swabbing were also conducted to evaluate the personal hygiene of food handlers in this research.</p> <p>With regards to cutting board swabbing, results showed that group 1 dropped by 16.6% while the remaining groups improved by 41.6%. In the case of hand swabbing all establishments in group 1 showed satisfactory results after training. Group 2, group 3 and group 4 showed 41.7% improvement. Statistics revealed that there was a significant improvement in the performance of food handlers in hand swabbing after the intervention In the case of cutting board swabbing, there was a considerable improvement.</p>	<p>Dubai</p>
---	--	--------------

<p>Pei Yee Woh, Kwai Lin Thong, Jerzy Marian Behnke, John Watkin Lewis & Siti Nursheena Mohd Zain(2016)</p>	<p>Migrant food handlers had poor knowledge on food safety with average knowledge on food handling practices. Three key factors were identified linked to the poor knowledge acquisition included poor participation in food training programs, low educational level and language barriers.</p>	<p>Peninsular Malaysia</p>
<p>Norrakiah Abdullah Sani & Oi Nee Siow (2014)</p>	<p>There was significantly positive correlation among the three levels and respondents possess good scores for knowledge about personal hygiene, foodborne diseases and temperature control of food; for attitudes on safe food handling, and for practices, specifically for appropriate hand washing, use of gloves in food preparation and prevention of food hazards. About 73.2% of respondents never attend any training related to food safety and majority show poor knowledge of pathogens associated with disease-causing agents as well as critical temperatures for storage of ready-to-eat foods.</p>	<p>Peninsular Malaysia</p>

CHAPTER 3

METHODOLOGY

3.1 Study design

This was a cross-sectional study focus on assessing the bacterial contamination (*Salmonella Typhi*, *Shigella species* and *Escherichia coli*) and personal hygiene awareness levels (knowledge, attitude and practice) among restaurant food handlers in Ampang (Selangor, Malaysia). This study was started on January 2019 till May 2019 within the time frame of 5 months.

3.2 Study location

This study was conducted in Ampang within the east of Selangor state with Global Positioning System (GPS) coordinates of 3°9'0"N 101°46'12"E. Ampang is a town, constituency in Hulu Langat District and parts of Gombak District, Selangor, Malaysia. It also a district border within Kuala Lumpur. It is one of the cities in Malaysia with 756,309 people.

There were 52.2km² is residential area, 1.3km² of industrial area and 3.9km² of trading area (Malaysia Statistics Department, 2011). High population cause the increase demand on restaurants development. Restaurant businesses grow as the individual capacity to cook and to eat food at home in no longer expected (Noraziah et al, 2012). In 2014, there were about 590 restaurants reported in Ampang (New Straits Time, 2014) and this number of restaurants surely increases in every year. 33 restaurants were chosen by using simple random sampling for this study. The study location is shown in Figure 3.1.



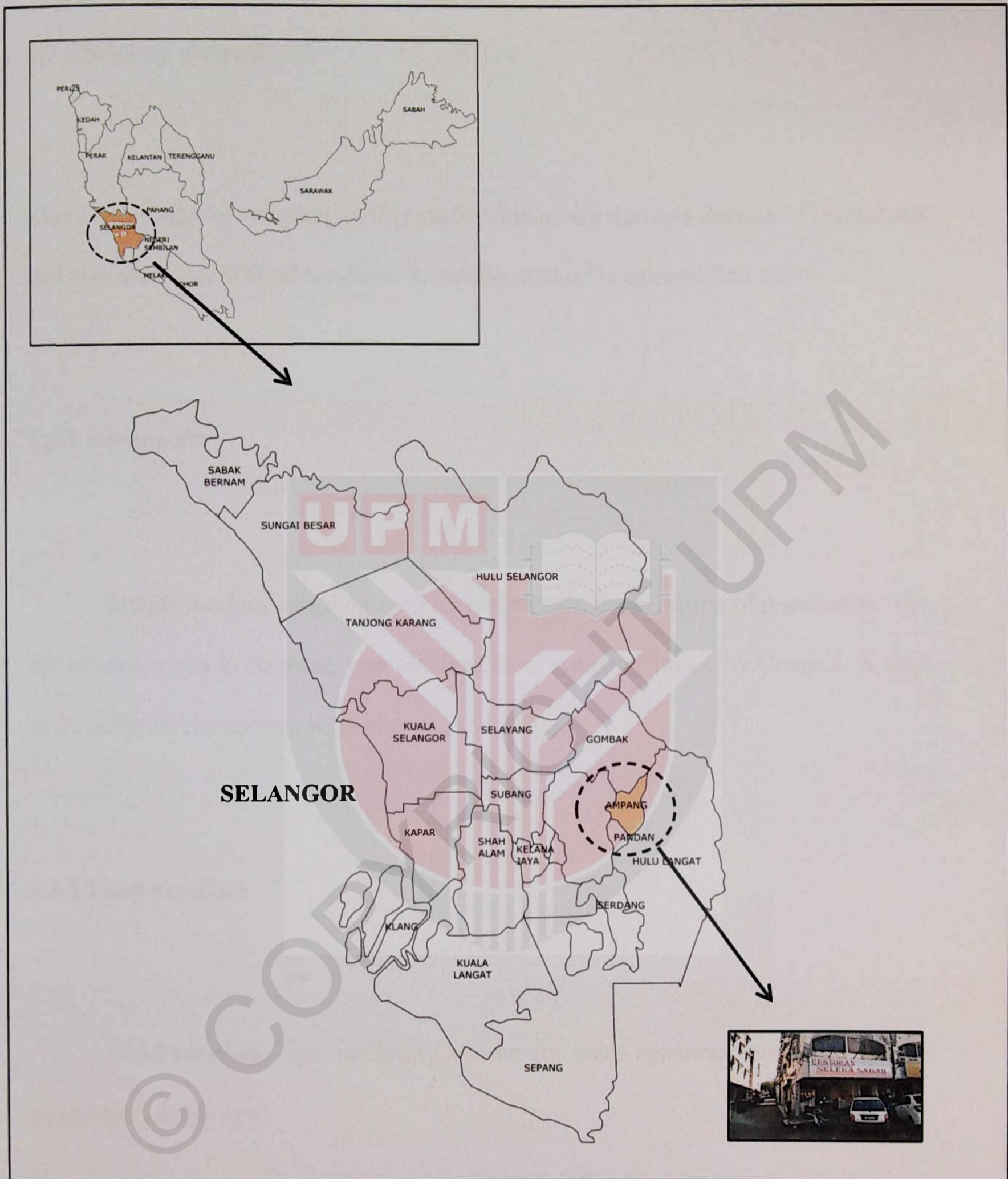


Figure 3.1: Maps of study location

3.3 Sampling method

There two stages of sampling in this study which were during selection of restaurants and also selection of food handlers. Sampling method is as described below:

3.3.1 Restaurant

Simple random sampling method was used in the selection of restaurants. The list of restaurants in Ampang was obtained from Ampang Jaya City Council. A total of 33 different restaurants were chosen randomly.

3.3.2 Food handlers

Food handlers were randomly chosen for each restaurant according to the calculated sample size.

3.4 Sample size determination

The sample size calculation used by following formula, Daniel (1999). The level precision should be reasonable and it is confidence that 95% of the sample estimated will be fall within 1.96 standard errors of the specified population value.

The sample size was determined using the sample size formula state by

$$n = \frac{Z^2_{1-\alpha} P(1 - P)}{d^2}$$

n = sample size

z = level of confidence according to the standard normal distribution (for a level of confidence of 95%, $z = 1.96$)

p = estimated proportion of the population that presents the characteristic

d = tolerated margin of error

Table 3.1: The sample size calculation based on each specific objective

No	Specific Objectives	Sample size calculation
1	To analyse the occurrence of bacteria (<i>Salmonella Typhi</i> , <i>Shigella species</i> and <i>Escherichia coli</i>) presence in food handlers' hands in Ampang, Malaysia.	Based on study of basic knowledge on food safety and food handling practices amongst food handlers with prevalence value 0.2 (Yee Who et., 2016): $n = \frac{4 \times 0.2(1-0.2)}{(0.09)^2}$ n=79
2	To assess personal hygiene awareness levels (knowledge, attitude and practice) among restaurant food handlers in Ampang, Malaysia.	Based on study of awareness level of food handlers in food service with prevalence value 0.5 (Norrakiah Abdullah et al., 2013): $n = \frac{4 \times 0.5(1-0.5)}{(0.05)^2}$ n=60
3	To assess the association between bacterial contamination and personal hygiene awareness	Based on study from Hui Key et al (2016)

<p>levels (knowledge, attitude and practice) among restaurant food handlers in Ampang (Selangor, Malaysia)</p>	<p>that study on the food safety awareness level and the microbiological hand hygiene of food handler with prevalence value 0.65:</p> $n = \frac{4 \times 0.65(1-0.65)}{(0.1)^2}$ <p>n=91</p>
--	---

From the sample size calculation based on specific objective, to assess the association between bacterial contamination and personal hygiene awareness levels (knowledge, attitude and practice) among restaurant food handlers in Ampang (Selangor, Malaysia) has the highest number of sample size which is 91 respondents. 20% from the total sample size which roughly 18 were added to reduce the likelihood of refusals. Therefore, the final sample size to study personal hygiene assessment and awareness of restaurant food handlers would require a sample size of 109 respondents.

3.5 Study population

The study was conducted in Ampang, Selangor involving restaurants and food handlers. Simple random sampling was used to select the respondents in Ampang, Selangor who fulfilled the inclusive criteria which are

- i. Food handler who works more than 3 months in the selected restaurant
- ii. Local and migrant food handlers

Exclusive criteria

- i. Food handler who is sick

3.6 Data collection technique and instrumentation

The research was divided into two parts. Part 1 included awareness level assessment using questionnaire among restaurant food handlers. Meanwhile, Part 2 is the assessment of bacterial contamination on hand among restaurant food handlers.

3.6.1 Questionnaires

A questionnaire is adapted and modified from previous study (Norrahmah et al., 2014 & Noor-Azira et al., 2012) in order to fit the personal hygiene issues among restaurant food handlers. This questionnaire consist 4 sections (Section A, B, C & D) of information. Section A was used to collect the socio-demographic information such as the food handlers' age, gender, race, job status, type of job, years of work experience, participation in food safety training and injection of typhoid vaccine.

Section B consists of 22 questions that test food handlers on the knowledge and understanding on personal hygiene. In the personal hygiene knowledge section, the food handlers were requested to select yes, no or not sure for each statement. One point will be given for each correct answer, whereas zero point for wrong answer or not sure. The scores were converted to percentage. In Section C, 10 questions were used to assess the food handlers' attitude on personal hygiene. Food handlers were asked to indicate their level of believe by using a five point rating scale (1 = never, 2

= rarely, 3 = sometimes, 4 = often and 5 = always). The scores for personal hygiene attitude were converted to percentage.

For Section D, 25 questions had been asked to food handlers to rate their personal hygiene practice by using five point rating scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often and 5 = always). The scores for personal hygiene practice were also be converted to percentage. The scale was recorded in the reverse order for negative statements. These scores were coded into three categorical variables: poor (<50%), moderate (50-80%) and good (>80%) (Yee Who et al, 2016).

3.6.1.1 Validity and Reliability

The reliability of the personal hygiene questionnaires designed was also determined by a pilot study on 30 food handlers at food premises. By using the Cronbach's Alpha test, the reliability coefficient test for the questionnaire was 0.773. A minimum standard of 0.7 indicated acceptable internal consistency for each questionnaire (Santos, 1999).

3.6.2 Bacterial Contaminants Assessment

3.6.2.1 Collection of sample

Hand swabbing was conducted to detect the presence of Bacteria (*Salmonella Typhi*, *Shigella species* and *Escherichia. coli*). Cotton bud was used to swab over the palm and fingertips of the food handler's hand. Then, the cotton buds were kept in 5ml of peptone alkaline water as a transport medium to the laboratory for immediate laboratory analysis. The samples were analysed within 5 hours to minimize the multiplication of bacteria.

3.6.2.2 Isolation of bacteria from specimen

The samples were vortexed for 10 seconds to release bacteria from the cotton swab. Dilution method was done for every sample followed by surface plate method. The bacterial contaminants were analysed using xylose lysine deoxycholate (XLD)

agar plate for *Salmonella* and *Shigella spp.* and eosin methylene blue (EMB) agar plate for *Escherichia coli* using pour plate technique. For dilution to detect *Salmonella* and *Shigella*, 0.1ml of specimen were added into 9.9ml of peptone alkaline water and vortexed it before poured 1 ml of the mixture on the XLD agar. Dilution method for the detection of *Escherichia coli*, 1ml of specimen were added into 9.9ml of peptone alkaline water. After vortexed the specimen, 1ml of the mixture were poured on EMB agar. Plates were aerobically incubated at 37 °C for 24 hours for evidence of microbial growth (*Salmonella spp.* & *Shigella spp.* and *Escherichia coli*).

3.6.2.3 Screening of bacterial occurrence

On xylose lysine deoxycholate (XLD) agar plate, *Salmonella spp.* appeared as red colonies with black centers and *Shigella spp.* also appear red. Meanwhile *Escherichia coli* on eosin methylene blue (EMB) agar plate appear in the formation of the green metallic sheen. The screening of bacterial occurrence was evident that the food handlers were contaminated with bacteria. Abundance of bacteria in especially *E.coli* reflects hygienic status of the food handlers.

3.7 Research flow

The present study consists of two main stages which are the interviewed sessions and the hand swabbing sampling. After introduce the purpose of study and the need of consent form to food handlers, the first stage was when the food handlers were interviewed by trained researcher to answer the questionnaires regarding the awareness level on personal hygiene. The restaurant hygiene status and the real personal hygiene practices of food handlers also been observed by researcher. Then, the second stage was the hands swabbing on the food handlers using cotton bud were conducted. Then, the samples were kept in 5ml of peptone alkaline water and were brought to laboratory within 5 hours for further laboratory analysis. The isolation of bacteria from specimen and screening of bacterial occurrence were been conducted in the laboratory. The results then were analysed through statistical analysis using Statistical Package for the Social Sciences (SPSS) Version 22.

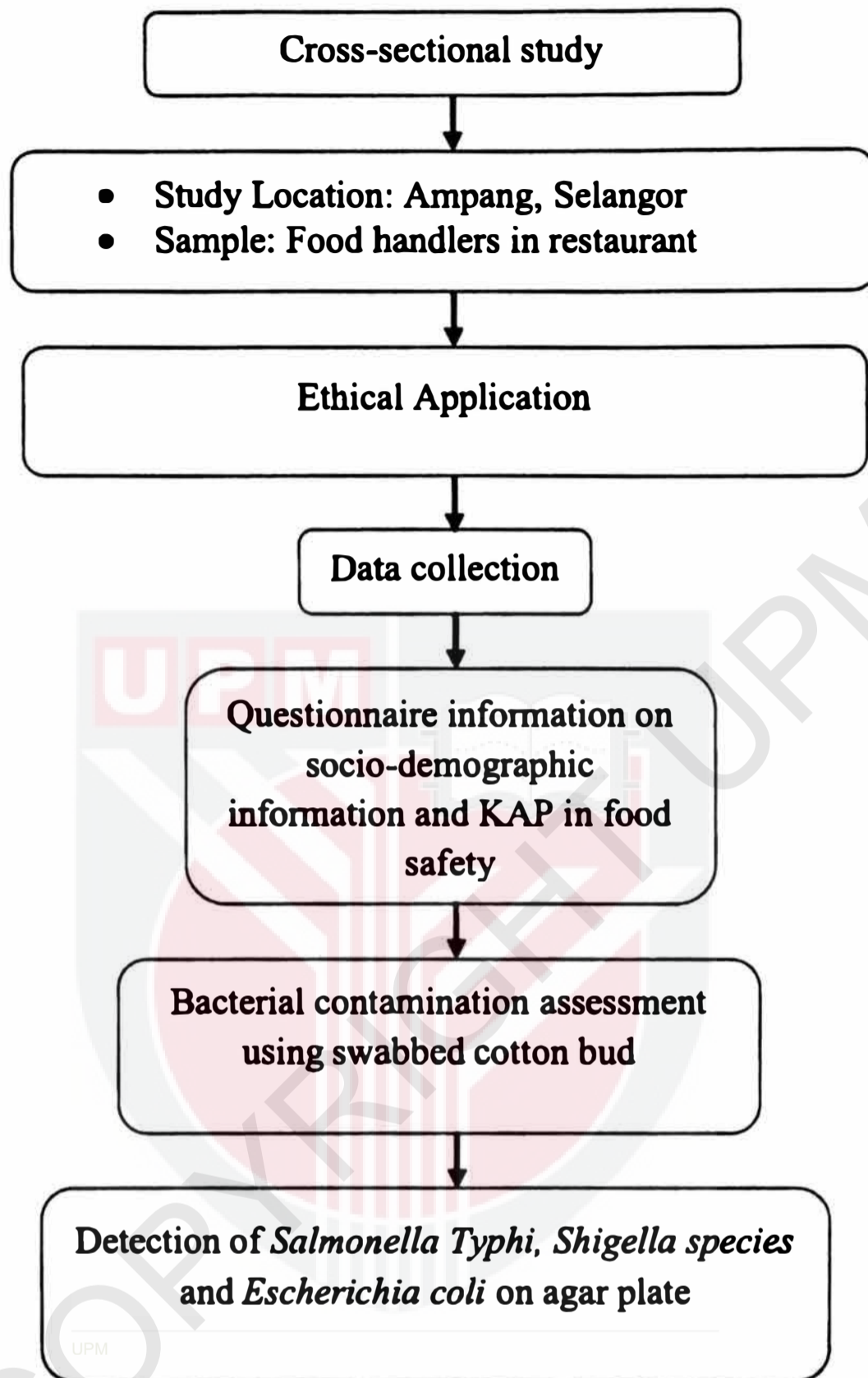


Figure 3.2: The flowchart of study

3.7 Data analysis

In this study, descriptive analysis was used to present the percentage, mean and standard deviation to explain the occurrence of bacteria (*Salmonella Typhi*, *Shigella species* and *E. coli*) presence in food handlers' hands and to assess personal hygiene awareness levels (knowledge, attitude and practice) among restaurant food handlers in Ampang, Malaysia. Chi square test was used to assess the association of bacterial contamination and personal hygiene awareness levels (knowledge, attitude and practice) among restaurant food handlers in Ampang (Selangor, Malaysia). All the data were analysed using Statistical Package for the Social Sciences (SPSS) Version 22.

Table 3.2: Statistical analysis for each specific objective

No.	Objectives	Statistical analysis
1	To analyse the occurrence of bacteria (<i>Salmonella Typhi</i> , <i>Shigella species</i> and <i>Escherichia coli</i>) presence in food handlers' hands in Ampang, Malaysia.	Descriptive analysis (frequency, percentage)
2	To assess personal hygiene awareness levels (knowledge, attitude and practice) among restaurant food handlers in Ampang, Malaysia.	Descriptive analysis (percentage, mean and standard deviation)
3	To assess the association of bacterial contamination and personal hygiene awareness levels (knowledge, attitude and practice) among restaurant food handlers in Ampang (Selangor, Malaysia)	Chi square test

CHAPTER 4

RESULTS

4.1. Food handlers & restaurant status in Ampang

A total of 114 food handlers from these 33 restaurants were involved in questionnaires sessions and hand swab sampling. Table 4.1 reveals the socio-demographic characteristics of the food handlers where the majority of food handlers (69%) were male and in the range of 21-30 years old (43%). Most of the food handlers were non-Malaysian (63.2%) and Malaysian (36.8%). Majority of the food handlers were married (63.2%), secondary school leavers (82.5%) and permanent worker (77.2%). Approximately 54.4% of food handlers have worked more than one type job while only 4 food handlers (3.5%) worked as cashier only. More than half of the food handlers have working experience between 1 and 5 years (57.9%). Most of the food handlers (71.1%) claimed that they received a typhoid vaccine. However, 47.4% of food handlers indicated that they did not attend any related food safety training. Other than that, 74.6% of food handlers agreed that the food illness impact associated with contaminated hand infection on consumers was very high. Majority of them (72.8%) also thought that the effectiveness of personal hand hygiene in minimizing food illness impact associated with contaminated hand infection on consumers were very high and 68.4% stated that the important of personal hand

hygiene at their restaurant is very high among to other factors associated with minimizing/preventing food illness.

Table 4.1 Socio-demographic of restaurant food handlers (n = 114).

Characteristics		n (%)
Age (years)	<20	8 (7)
	21-30	49 (43)
	31-40	23 (20.2)
	41-50	22 (19.3)
	>50	12 (10.5)
Gender	Male	69 (60.5)
	Female	45 (39.5)
Nationality / Country	Malaysian	42 (36.8)
	Non Malaysian	72 (63.2)
Status	Single	42 (36.8)
	Married	72 (63.2)
Education level	Primary	16 (14)
	Secondary	94 (82.5)
	University	3 (2.6)
	No formal education	1 (0.9)
Job status	Permanent	88 (77.2)
	Part time	18 (15.8)
	Contract	8 (7.0)
Type of job	Cook	27 (23.7)
	Bartender	2 (1.8)

	Cashier	2 (1.8)
	Waiter	17 (14.9)
	Manager/supervisor	4 (3.5)
	More than 1	62 (54.4)
Working experience(years)	<1 year	31 (27.2)
	1-5 years	66 (57.9)
	6-10 years	10 (8.8)
	>10 years	7 (6.1)
Participation in food safety training	Yes	60 (52.6)
	No	54 (47.4)
If yes, food safety organized by	Government	1 (0.9)
	Private	0 (0)
	Sponsored by restaurant	51 (44.7)
	Individual	8 (7)
If yes, the frequency of participating in food safety training / courses within a year	Once a year	1 (0.9)
	Once in lifetime	59 (51.8)
Are you taking a typhoid vaccine?	Yes	81 (71.1)
	No	33 (28.9)
If yes, when was the last vaccine injection?	<1 year ago	42 (36.8)
	1-3 years ago	38 (33.3)
Use of personal protective equipment; (i) Glove	Yes	17 (14.9)
	No	97 (85.1)
(ii) Clean shirt	Yes	114 (100)

	No	
(iii) Shoe	Yes	83 (72.8)
	No	31 (27.2)
(iv) Cap/hair cover	Yes	72 (63.2)
	No	42 (36.8)
In general, what is the food illness impact associated with contaminated hand infection on consumers?	High	29 (25.4)
	Very high	85 (74.6)
What is the effectiveness of personal hand hygiene in minimizing/preventing food illness impact associated with contaminated hand infection on consumers	High	31 (27.2)
	Very high	83 (72.8)
Among all the factors associated with minimizing/preventing food illness, how important is personal hand hygiene at your restaurant?	High	36 (31.6)
	Very high	78 (68.4)

A total of 33 different restaurants in Ampang was involved in this study. Figure 4.1 shows that there were 15.2% were Grade A restaurant, 24.2% were Grade B restaurant and the remaining (60.6%) still not been grade yet.

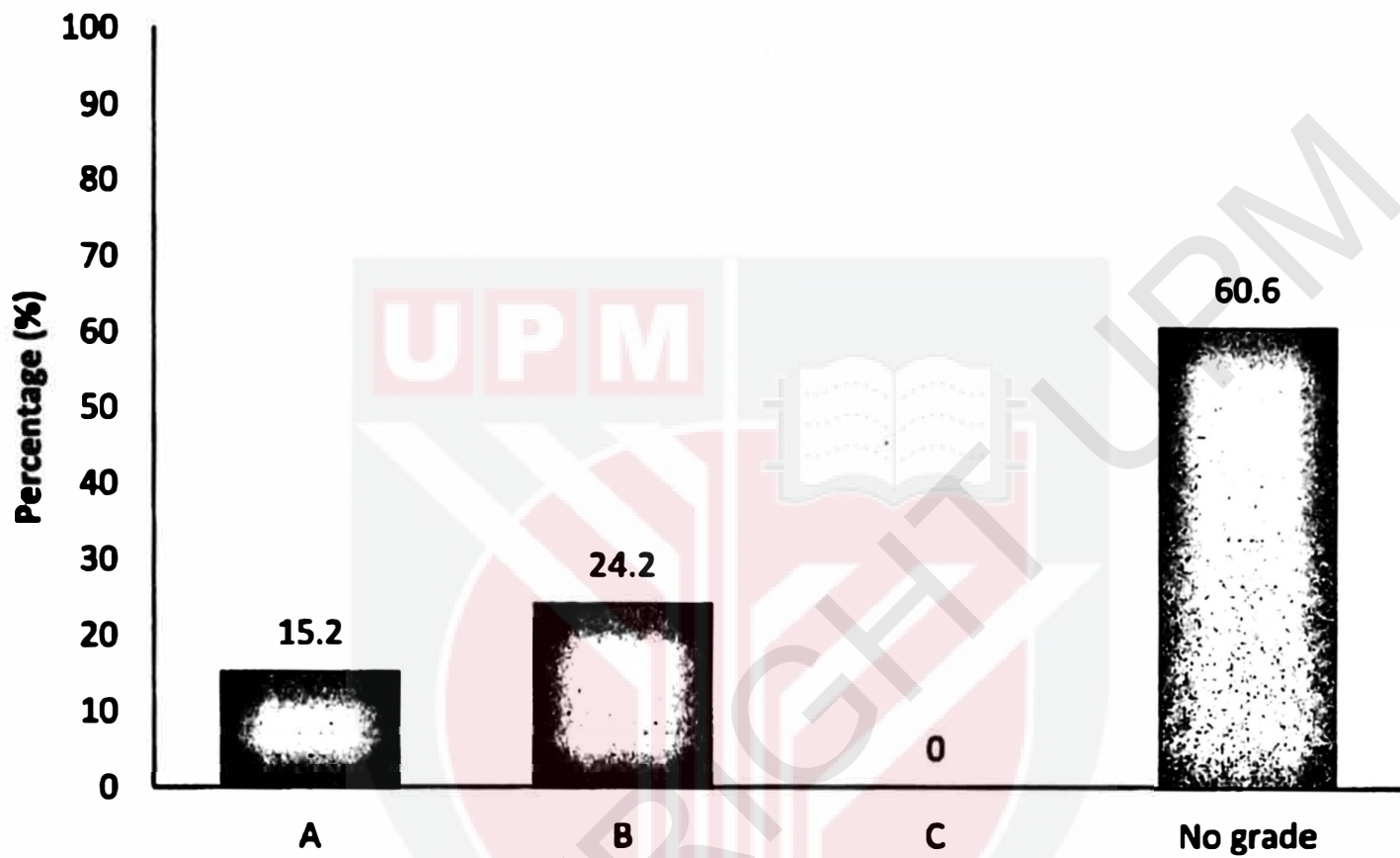


Figure 4.1 Grade premises for restaurants in this study

4.2. Bacteria occurrence presence in food handlers

The first aim of this study was to analyse the occurrence of bacteria (*Salmonella Typhi*, *Shigella species* and *Escherichia coli*) presence in food handlers' hands in Ampang, Malaysia. Figure 4.2 shows the result of the screening of bacteria occurrence presence in food handlers. This study finding showed that 81.6% of food handlers were positive for *Shigella*, 34.2% of food handlers were positive for *E. coli* and 14.9% were positive for *Salmonella*. Thus, *Shigella* is the highest bacteria present in the food handlers, followed by *E coli* and *Salmonella*.

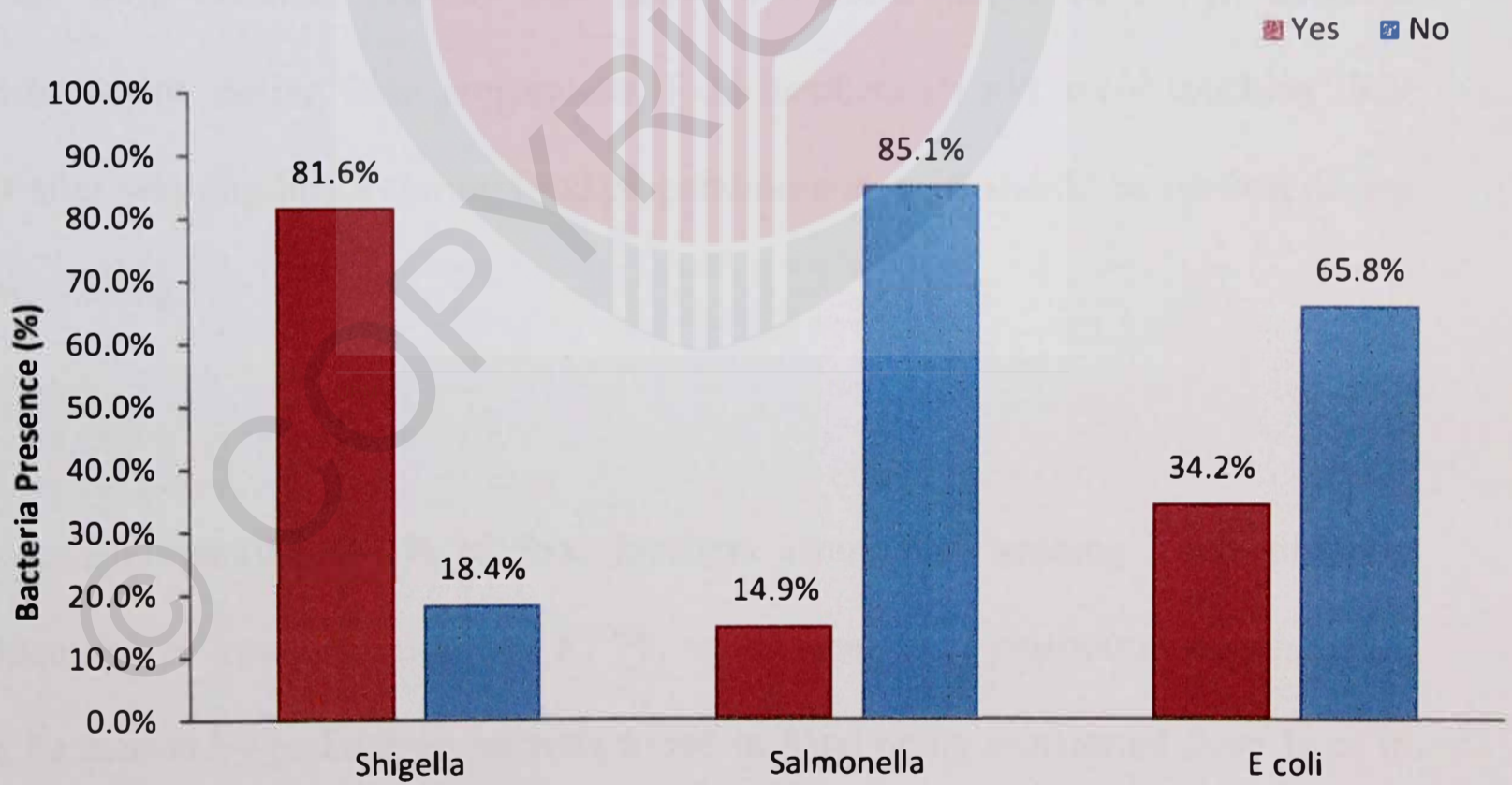


Figure 4.2 Bacteria occurrence presence in food handlers (n = 114)

4.3 Awareness level of restaurant food handlers in Ampang (Selangor).

4.3.1 Knowledge level of restaurant food handlers

As shown in Figure 4.3 regarding the knowledge level of restaurant food handlers in Ampang, the mean knowledge percentage score of all 114 food handlers was 87.6% which was considered good as it was above 80% (Yee Who et al, 2016). According to Figure 4.3, 100% of food handlers were knowledgeable that good hygiene knowledge is important to prevent food illness, restaurant food handlers must wash their hands often regularly and hands need to be dried after washing. All of the food handlers (100%) also know that short finger nails will decrease contamination during food preparation, food handlers should avoid touching their hair after washing hands during food preparation and wrist should be washed during handwashing.

Additionally, 99.1% of food handlers aware that washing hands properly reduce risk of contamination and 87.7% agreed that food poisoning/contamination can be caused by pathogenic bacteria found in hand being transferred from hand to food. Most of the food handlers (98.2%) know that soap was compulsory to be used in hand washing. However, 35.1% of food handlers did not know the correct techniques of hand washing and 73.7% of the food handlers disagreed that it was enough just by washing hands under running water to remove bacteria before touching food. Findings show that most of the food handlers (98.2%) knew that

rings, watch and wrist should be removed during handwashing. Other than that, 25.4% of food handlers did not aware that they cannot involve in food preparation when they were sick.



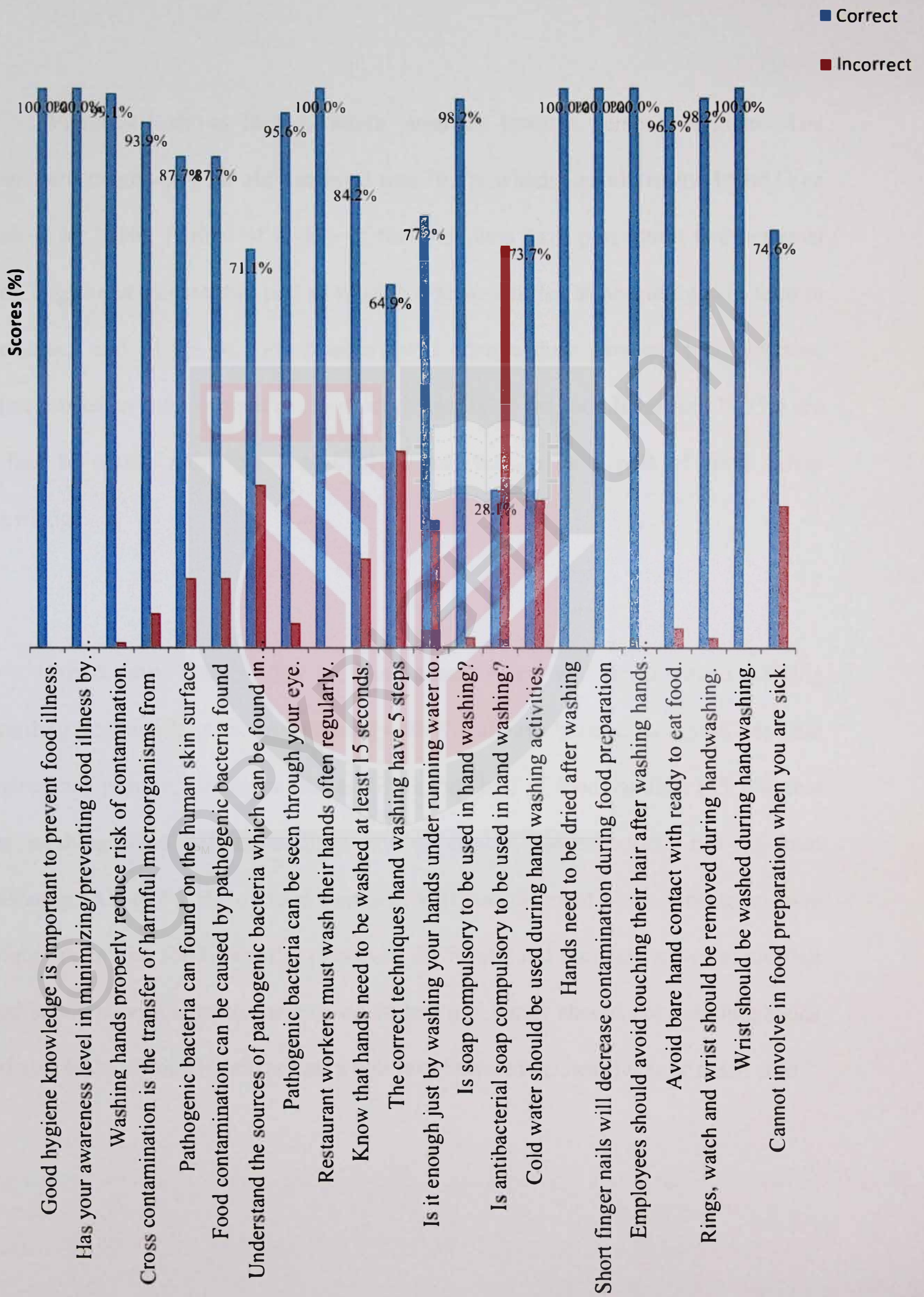


Figure 4.3 Food handlers' knowledge related to personal hygiene (n = 114)

4.3.2. Attitude level of restaurant food handlers

Figure 4.4 shows food handlers' attitudes towards personal hygiene. The mean percentage score for attitude level was 76.2% which considered moderate (Yee Woh et al, 2016). A total of 75.8% of food handlers have perception that personal hand hygiene is an essential part of my job responsibilities in providing safe food to consumers and 71.9% of food handlers will change their personal hand hygiene behaviour when they know it is incorrect. Majority of the food handlers (71.1%) are willing to obtain more personal hygiene information as a part of food safety knowledge.

Apart from that, 67.5% of food handlers are willing to attend training regarding personal hygiene. Additionally, 86.8% always believe that good personal hygiene can prevent foodborne illness. More than half of food handlers (85.1%) feel that washing hand before handling raw or cooked foods reduces risk of food poisoning. About 96.5% of food handlers will use different clean clothes to mop dining tables and food utensils. However, 2.6% of food handlers never agree that food handlers with abrasion or cuts on fingers and hands should not handling foods and also 6.1% of food handlers rarely will take leave when sick, fever or catch cold.

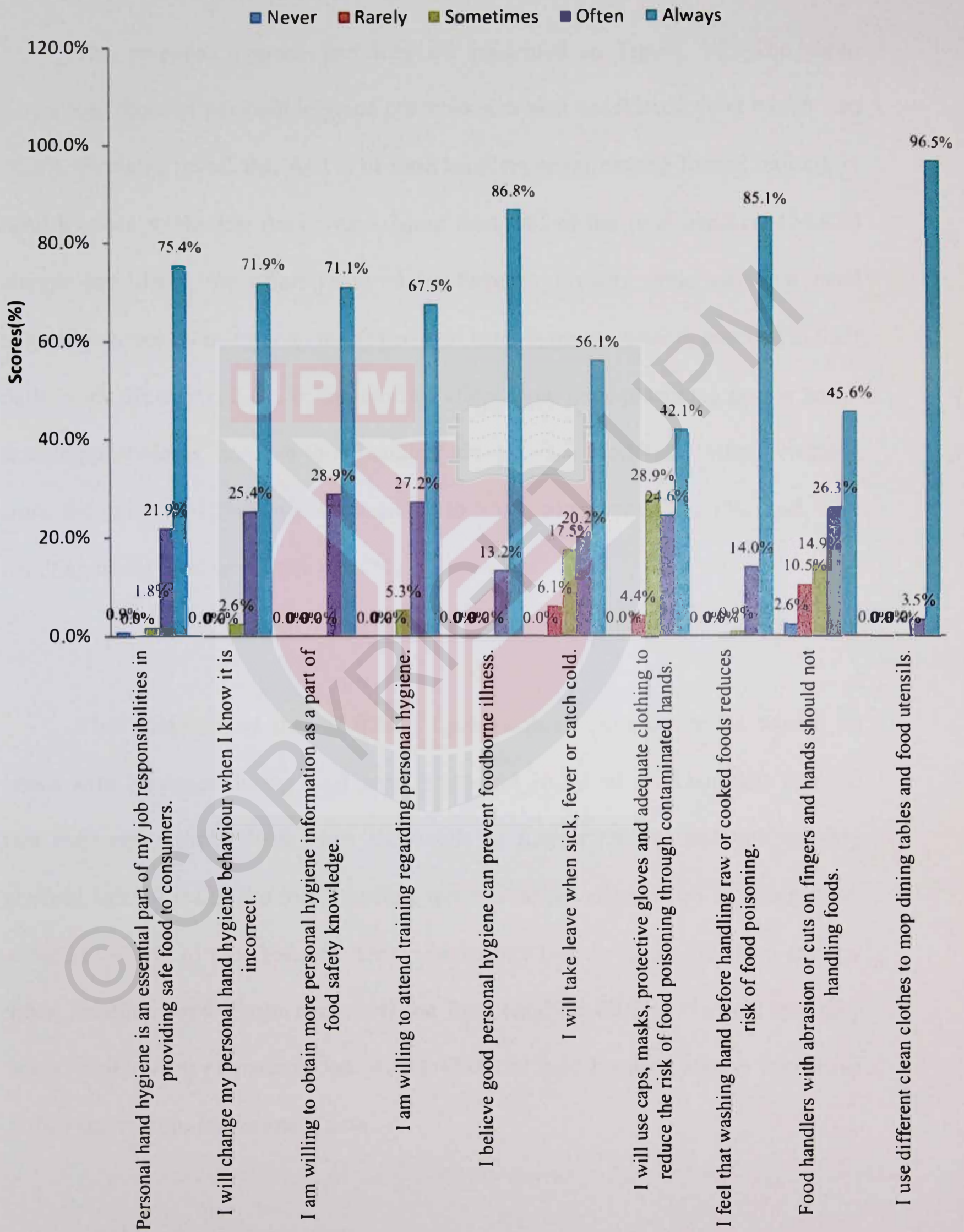


Figure 4.4 Food handlers' attitude related to personal hygiene (n = 114).

4.3.3 Practices level of restaurant food handlers

The personal hygiene practices are presented in Figure 4.5. The mean percentage score of personal hygiene practices was also considered good which was 76.6%. Findings reveal that 42.1% of food handlers never receive formal training in hand hygiene in the last three years. More than half of the food handlers (54.4%) always considered the effort required by them to perform good personal hand hygiene practice by using soap made personal hand hygiene easier to practice in their daily work. However, 2.6% of the food handlers sometimes practicing proper hand-washing procedures. Most of food handlers always wash their hands when returning from the toilet (94.7%), when returning to work after break (85.1%) and after handling waste food or rubbish (94.7%).

This study shows that 22.8% of food handlers often cover the wound on hands with bandages during food preparation and 76.3% of food handlers claimed that they never touch food when the hands or fingers are cut and not properly covered and 94.7% of the food handlers never wear jewellery when handling food. A total of 47.4% of food handlers always make sure that the hands are clean and dry when handling food. Furthermore, all the food handlers (100%) claimed that they never smoke when preparing food. About 47.4% of food handlers always take leave if they suffer from foodborne illness.

Apart of that, many food handlers claimed that they always put on a clean and suitable uniform (88.6%), put on proper shoes (74.6%), put on an apron (76.3%), put on a cap (64%) before starting work. However only 0.9% of food handlers always wear mask before starting work. About 27.2% of food handlers did not take vaccine injection and 32.5% never go for medical health check for every six months. Majority of food handlers (68.4%) stated that by knowing the results of personal hand hygiene observation in their hand will help to improve their hand hygiene practices.



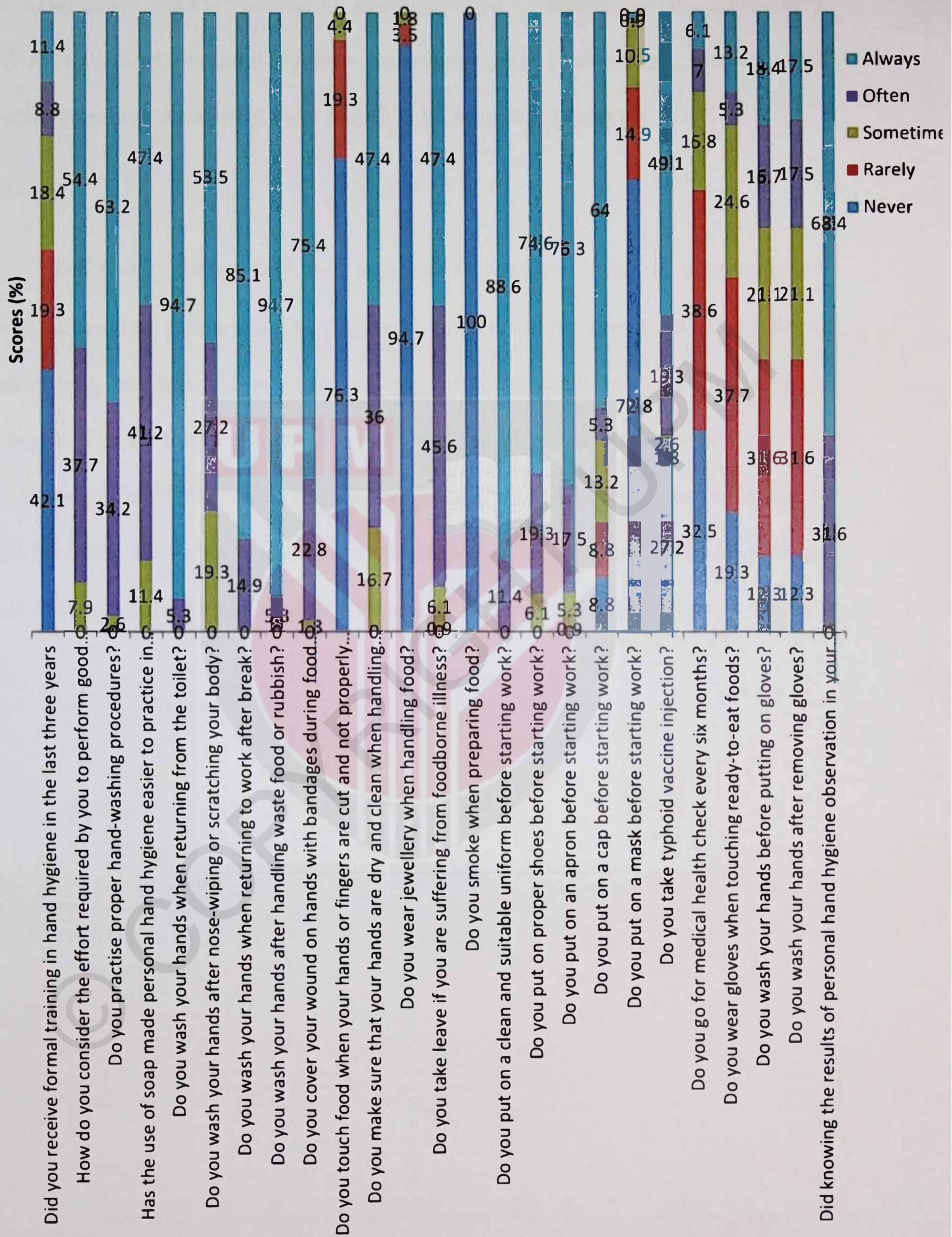


Figure 4.5 Food handlers' practice related to personal hygiene (n = 114)

4.4 Association between bacterial contamination (*Shigella species*, *Salmonella* and *E. coli*) and personal hygiene awareness level (knowledge, attitude and practice) among restaurant food handlers in Ampang, Malaysia

Table 4.2 shows that the association between bacterial contamination (*Shigella species*, *Salmonella* and *E. coli*) and personal hygiene awareness level (knowledge, attitude and practice) among restaurant food handlers in Ampang, Malaysia. The findings revealed that there were no significant associations between the awareness level with bacterial (*Shigella* and *Salmonella*) occurrence in restaurant food handlers. However, there was significant association between the knowledge level of food handlers and *E. coli* in restaurant food handlers' hands.

Table 4.2 The association between bacterial contamination (*Shigella species*, *Salmonella* and *E. coli*) and personal hygiene awareness level (knowledge, attitude and practice) among restaurant food handlers in Ampang, Malaysia.

	Yes	No	X ²	p
<i>Shigella</i>				
Knowledge			0.085	0.771
Attitude	93 (81.6%)	21 (18.4%)	0.332	0.847
Practice			0.058	0.809
<i>Salmonella</i>				
Knowledge			0.002	0.962
Attitude	17 (14.9%)	97 (85.1%)	3.011	0.222
Practice			0.69	0.793
<i>E. coli</i>				
Knowledge			3.878	0.049*
Attitude	39 (34.2%)	75 (65.7%)	1.978	0.372
Practice			0.351	0.554

Chi square test

*p value significant at 0.05

CHAPTER 5

DISCUSSION

5.1 Restaurant hygiene status in Ampang

From 33 different restaurants in Ampang involved in this study, there were 15.2% were Grade A restaurant, 24.2% were Grade B restaurant and the remaining (60.6%) still not been grade yet (Figure 4.1). This is because most of the restaurant food handlers claimed that the restaurants are just operated, thus the restaurants were still not be checked by the local government. These grades are necessary to food premises as it is in Food Hygiene Regulations 2009.

Moreover, it is to inform the customer about its level of cleanliness and to ensure that food handlers keep to the standards of hygiene. The inspection of food premises included the cleanliness, food storage, food handlers, food quality and safety, waste disposal and waste management, equipment and utensils, loading area and vector control. Food premises grading are divided into three which are Grade A (75% and above), Grade B (between 50% and 74%) and Grade C (below 50% are given a Grade C). Therefore, this finding revealed that the cleanliness and hygienic

level of some restaurants in Ampang were still in unsatisfactory result as there were restaurants did not have grade yet.

5.2 Bacteria occurrence presence in food handlers

Finding (Figure 4.2) shows that *Shigella* is the highest (81.6%) bacteria occurrence present in the food handlers, followed by *E coli* (34.2%) and *Salmonella* (14.9%). Studies by Siti Sahara et al (2018) had mentioned that the fact that pathogens remain viable on food contact surfaces such as copping board, knife and plates and present a contamination hazard for considerable periods of time, dependent on the contamination levels and type of pathogen. Furthermore, cross-contamination events are influenced by the microbiological contamination rate on the food contact surfaces and the probability of microbial transfer to the food products including the surrounding environmental factors such as airborne microbial transfer rate (Little & Sagoo 2009).

Shigella was associated with raw vegetables, shellfish, chicken and potato salads from the kitchen (US Food Safety, 2019). Studies done by Lampel et al (2003) mentioned that *Shigella spp.* can grow at temperatures between 6 °C and 48 °C and at a pH of between 4.8 and 9.3. In addition, *Shigella* can survive at room temperature for up to 50 days in foods such as milk, flour, eggs, clams, shrimp, and oysters, and only 5–10 days in acidic foods (e.g., orange juice, tomato juice, carbonated soft drinks) and 1–2 weeks in refrigerated, fermented milk. In addition, *Shigella spp.* are

highly host-adapted pathogens and this pathogen may be found in any food matrix (Maurelli, 2013). Thus, these were the reason *Shigella* was the highest bacteria present on food handlers' hand.

Apart from that, although that the food handlers claimed that they have good personal hygiene practice, but from the observation checklist (appendix iv), most of the food handlers (73.7%) did not wash hands using proper technique and only about 9.6% use soap in hand-washing. Proper handwash technique used is more important than the duration of hand washing. (Allam et al, 2016). In addition, Allam et al (2016) in their studies also mentioned that plain soap plays role in the prevention of spread of bacteria. Even from the findings (Figure 4.5), only 47.4% of food handlers claimed that they always used soap during handwash. Thus, *Shigella*, *E. Coli* and *Salmonella* present on the hands of food handlers because they did not apply the soap.

Maintaining good personal hygiene is important as pathogenic bacteria such as *Salmonella*, *Shigella* and *E coli* may bring harmful health effects to the population. Screening of bacteria occurrence presence in food handlers was conducted to obtain a better insight into the current personal hygiene in food premises. Previous studies by Tan et al (2013) on the food handlers' hands in food premises have found the range of incidence for *E coli* was from 68.24% to 71.76%. Other studies by Hui Key et al. (2017), found that *Salmonella* was detected on the hands of about half of the participated food handlers. The bacterial occurrence reflects the real knowledge, attitude and practices of personal hygiene of food handlers.

5.3 Awareness level of restaurant food handlers

5.3.1 Knowledge level of restaurant food handlers

This study (Figure 4.3) shows that 100% of the food handlers know that the restaurant workers must wash their hands often regularly. Similarly, studies done by Yee Who et al (2016) and Noorakiah & Siow (2013) also reported majority of food handlers in food service know that hand washing need to be conducted regularly. On the other hand, 73.7% of the food handlers disagreed that is was enough just by washing hands under running water to remove bacteria before touching food. Similar result was acquired by Yee Who et al. (2016) which stated that more than half of the food handlers in food establishment disagreed with the statement.

Majority of the food handlers (98.2%) knew that rings, watch and wrist should be removed during handwashing. Previous studies from Norhaslinda et al. (2016) had mentioned that wearing accessories during food preparation could cause bacterial contamination. A study was done by Mengual et al (2016) found that food handlers accessories such as rings, piercings, necklaces, earrings, bracelets hold a significant bacterial and these items are a high risk source for the food contamination if the food handlers wear it when involving in food preparation or food serving at restaurants. Apart from that, 25.4% of food handlers did not aware that they cannot

involve in food preparation when they were sick similar findings with study by Tan et al. (2013) involving food handlers at schools in Selangor (Malaysia).

5.3.2 Attitude level of restaurant food handlers

This study (Figure 4.4) revealed that most of the food handlers (75.4%) had positive attitudes regarding the statement of personal hand hygiene is an essential part of their job responsibilities in providing safe food to consumers. This result was quite similar to a result obtained by Tan et al. (2013) among food handlers at food premises in school that mentioned most of the respondents agreed with the statement. Proper handling may decrease or eliminate food contaminants.

A total of 71.1% of food handlers were willing to obtain more personal hygiene information as a part of food safety knowledge and 67.5% of them were willing to attend training regarding personal hygiene. Similar findings by Noorakiah and Siow (2013) in which most their food handlers agreed to take part in whatever training courses if giving chance to them. Findings found that, 2.6% of food handlers never agree that food handlers with abrasion or cuts on fingers and hands should not handling foods. A food handler with a cut or wound on his or her hand is not allowed to handle food or food contact surfaces until the injury is completely covered by a waterproof dressing that is firmly secured and brightly coloured (FAO, 2004).

5.3.3 Practice level of restaurant food handlers

This study (Figure 4.5) shows that the food handlers have moderate practices with 76.6% higher than study by Hui Key et al (2016) in food premises that found the respondents had poor personal hygiene practices with 53.2% especially in maintaining safe practices. The studies also mentioned that, good knowledge and attitude did not necessarily reflect good practices. Figure 4.5 indicated that 42.1% of food handlers never receive formal training in hand hygiene in the last three years and 72.8% of food handlers never put on a mask before starting work, similarly to studies by Tan et al. (2013) that some of their respondents had not been exposed to any food handlers training and 98.8% of their respondents did not wear masks at all.

Studies by Mohd Firdaus et al (2015) had mentioned that there was considerable evidence that food handlers with good knowledge of food handling actions did not conduct satisfied behavior of their personal hygiene. This proved that food handlers might not practice good personal hygiene when handling foods although most of the food handlers in this survey gave positive answers. Moreover, majority of food handlers (68.4%) stated that by knowing the results of personal hand hygiene observation in their hand will help to improve their hand hygiene practices. Therefore, motivation, initiative, and training, should be provided to encourage food handlers practicing appropriate good personal hygiene practices during food preparation.

5.4 Association between bacterial contamination (*Shigella species*, *Salmonella* and *E. coli*) and personal hygiene awareness level (knowledge, attitude and practice) among restaurant food handlers in Ampang, Malaysia

Finding (Table 4.2) shows that there was significant association between the knowledge level of food handlers and *E. coli* in restaurant food handlers' hands. *E. coli* is considered one of the enteric pathogens that are believed to be capable of being transmitted by food handlers. Studies done by Allam et al (2016) found that there was significant association between hand contamination rate and low educational level. This could be attributed to ignorance of safety instructions and noncompliance to hygienic practice. In this study, the significant association between the knowledge level of food handlers and *E.coli* in restaurant food handlers' hands shows the importance of personal hygiene knowledge among restaurant food handler is important and it reflect the real restaurant food handlers' personal hygiene practice.

Although the personal hygiene awareness level of food handlers was considered good, with knowledge (87.6%), attitude (76.2%) and practice (76.6%), but from the study observation, some of the results (Figure 4.4) were inconsistent with the questionnaires answered by food handlers. For instance, most of food handlers reported that they wash hands after nose-wiping or scratching your body, but from observation found out that there were still food handlers who are doing the opposite. Most of food handlers were observed that they did not wash their hands

properly, yet 63.2% of them claimed that they practice proper hand-washing procedures. This can be the reasons of no significant association between the awareness level with bacterial contamination for *Shigella* and *Salmonella*.

Previous study by Key Lee et al (2016) also reported that the findings from their study were not encouraging as many food handlers in food premises were found to have microbial counts exceeding the standards. The studies also added that the microbiological hygiene assessment reflects the real practices of proper safe food handling and the provision of food safety and hygiene knowledge is not necessarily translated into safe handling food behavior or practice. Similarly, this study results indicated that the generally moderate performance on personal hygiene awareness level were not reflected in the microbial hand hygiene assessment.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Association between the bacterial contamination and personal hygiene awareness level are not simple to establish. The food handlers have good knowledge level (87.6%) of personal hygiene and moderate level for attitude (76.2%) and practice (76.6%) part. However, the total awareness level (knowledge, attitude and practice) were not directly indicate the bacterial occurrence on food handlers' hands as there were the presence of bacteria with *Shigella* was the highest followed by *E.coli* and *Salmonella*. The presence of bacteria on food handlers' hands indicated a failure in actually practicing good personal hygiene of food handlers while handling food. This study also revealed that there were no significant associations between the awareness level with bacterial (*Shigella* and *Salmonella*) occurrence in restaurant food handlers. However, there was significant association between the knowledge level of food handlers and *E. coli* in restaurant food handlers' hands. Thus, the importance of the personal hygiene should be emphasized by every food handlers.

6.2 Recommendation

The importance of the personal hygiene should be emphasized by every food handlers and also the monitoring authorities of the food premises. It is recommended that periodic assessment on the personal hygiene status of food handlers to be included in regular restaurant inspection activities. Even though restaurant food handlers were aware of the need for personal hygiene, more awareness needs to be created. Restaurant food handlers need to be kept neat always. Hands on and refresher training on the proper personal hygiene especially on correct hand wash technique should be provided for the food handlers. These activities could help in increasing the hygiene level of the restaurant, and reduce the risk of bacteria transmission on food for consumers.

REFERENCES

- Abdalla, M. A., Suliman, S. E., & Bakhiet, A. O. (2009). *Food safety knowledge and practices of street food-vendors in Atbara City (Naher Elneel State Sudan)*. *African Journal of Biotechnology* , 8(24), 6967-6971.
- Abdul Mutalib, N.A., Syafinaz, A.N., Sakai, K. & Shirai, Y. (2015). An overview of foodborne illness and food safety in Malaysia. *Inter-national Food Research Journal*, 22(3): 896-901.
- Ahmed E. Yousef & Carlstrom, C. *Food Microbiology: A Laboratory Manual*. The Ohio State University.
- Aisha M. Abushelaibi, Baboucarr Jobe, Hanan S. Afifi, Bahaa-Elden Mostafa Asia A. Murad & Abdulwahed K. Mohammed. (2015). Evaluation of the effect of person-in-charge (PIC) program on knowledge and practice change of food handlers in Dubai. *Food control* 2015 v.50 pp. 382-392
- Al-Shabib, Nasser Abdulatif, Sameh Hassan Mosilhey, and Fohad Mabood Husain. (2016). Cross-sectional study on food safety knowledge, attitude and practices of male food handlers employed in restaurants of King Saud University, Saudi Arabia. *Food Control*, Vol. 59, 2016, pp. 212-17.
- Allam, H. K., Al-Batanony, M. A., Seif, A. S., and Awad, E. T. (2016). Hand Contamination among Food Handlers. *British Microbiology Research Journal*, 13(5)

- Bas, M., Ersun, A. S., & Kıvanç, G. (2006). The evaluation of food hygiene knowledge, attitudes, and practices of food handlers in food businesses in Turkey. *Food Control*, 17, 317e322
- Bassyouni RH, El-Sherbiny N, Hefzy EH, Wegdan AA. (2012). Perception of food safety and prevalence of *Staphylococcus aureus* and *Salmonella species* carries among Fayoum University food handlers. *Life Science Journal*. 2012;9(4):2934-2940.
- Campos, A. K. (2009) Assessment of Personal Hygiene and Practices of Food Handlers in Municipal Public Schools of Natal, Brazil. 2009;20:807- 10.
- Chen, H. J., Wang, Y. (2013). The changing food outlet distributions and local contextual factors in the United States. *BMC Public Health*. Retrieved from <https://bmcpublikealth.biomedcentral.com/articles/10.1186/1471-2458-14-42>
- Department of Statistics Malaysia. (2016). Compendium of Environment Statistic 2016. The Office of Chief Statistics, Malaysia.
- Dominguez, R. B., Akhtar Hayat, Alonso, G. A., Gutiérrez, J. M., Muñoz, R., Marty, J. L. (2017). Nanomaterial-Based Biosensors For Food Contaminant Assessment. *Nanobiosensor*. 805-839.
- Food and Agriculture Organization of the United Nations. (2004). Food Safety Legislationscience And Risk-Based Approaches To Harmonization Food Safety Legislation In Malaysia. FAO/WHO Regional Conference On Food Safety For Asia And The Pacific. Seremban, Malaysia, 24-27 May 2004

Food Hygiene Regulation 2009. Malaysia Attorney General's Chambers.

Ghazali, Hazrina and Othman, Mohhidin and Mohamad Nashuki, Nasyira and Roslan, Nurul Amirah (2012) *Food hygiene knowledge, attitudes and practices among food handlers in restaurant in Selayang area*. In: 11th International Annual Symposium on Sustainability Science and Management 2012, 9-11 July 2012, Kuala Terengganu, Malaysia. (pp. 611-615).

Hajdinjak, S., and Jevšnik, M. (2008). Personal hygiene awareness among food handlers. *International Journal of Sanitary Engineering Research*, Vol. 2.

Hui, K. L., Hishamuddin, A. H., Kwai, L. T., & Lay, C. C. (2016). Assessment of Food Safety Knowledge, Attitude, Self-Reported Practices, and Microbiology Hand Hygiene of Food Handlers. *International Journal of Environmental Research and Public Health*.

Kramer, A., Schwebke, I. and Kampf, G. (2006). How long do nosocomial pathogens persist on inanimate surfaces? A systematic review. *BMC Infect Dis.* 2006; 6: 130.

Lambrechts, A., Human, I. S., Doughari, JH., & Lues, J. F. (2014). Bacterial contamination of the hands of food handlers as indicator of hand washing efficacy in some convenient food industries in South Africa. *Pakistan journal of medical sciences*, 30(4), 755–758.

Lampel, K. A., & Sandlin, R. (2003). Shigella. *Encyclopedia of Food Sciences and Nutrition (Second Edition)*, 2003.

- Linscott, A. J. (2011). Food-borne Illnesses. *Clinical Microbiology Newspaper*. 2011.
- Little, Christine & Sagoo, Satnam. (2009). Evaluation of the hygiene of ready-to-eat food preparation areas and practices in mobile food vendors in the UK. *International journal of environmental health research*. 19. 431-43. 10.1080/09603120903079364.
- Lopez, E. S., Gontijo, T. P., Boggione, M.G., Albino, A. A., Batalha, L. S., & Mendonça, C. S. (2018). Microbiological Contamination in Foods and Beverages: Consequences and Alternatives in the Era of Microbial Resistance. *Microbial Contamination and Food Degradation*. Pages 49-84
- Lucey, J. (2006). Personal Hygiene and Food Safety Tips. *Food Quality and Safety*. Retrieved from <https://www.foodqualityandsafety.com/article/personal-hygiene-and-food-safety/>
- Martins, R.B., Hogg, T. and Otero, J.G. (2012) Food Handler's Knowledge on Food Hygiene: The Case of a Catering Company in Portugal. *Food Control*, 27, 206-213.
- Maurelli, A. T. (2013). Shigella and enteroinvasive Escherichia coli. *Escherichia coli (Second Edition)*. 2013, Pages 215-245. doi: 10.1016/B978-0-12-397048-0.00007-3
- Mengual, M., Gamez, N. M., Carced, I., Lopez, M. A. & Alava, J. I. (2016). Accessories of Food Handlers and Restaurant Staff as a Source for Food Contamination. *Journal of Food: Microbiology, Safety & Hygiene*. 1(105) doi: 10.4172/2476-2059.1000105

Ministry of Health Malaysia. (2010). Statistik e Fakta Kesihatan. Retrieved on 4th October, 2010 from. http://www.moh.gov.my/v/stats_si.

Ministry of Health (MOH). (2007). Annual Report 2007. MOH; Putrajaya, Malaysia: 2007.

Mohd. Firdaus Siau, A., Son, R., Mohhiddin, O., Toh, P.S. and Chai, L.C. (2015). Food court hygiene assessment and food safety knowledge, attitudes and practices of food handlers in Putrajaya. *International Food Research Journal* 22(5): 1843-1854 (2015)

MyHealth. (2015). Contaminants in Food. Health Online Unit, Ministry of Health Malaysia. Retrieved from <http://www.myhealth.gov.my/en/contaminants-in-food/>

New Straits Times. (2015). Eateries still not cleaning up. Retrieved from <https://www.nst.com.my/news/2015/09/eateries-still-not-cleaning> on 23rd September 2014.

Noor-Azira, A.-M.; Mohammad-Faid, A.-R.; Shuhaimi, M.; Syafinaz, A.-N.; Hamat, A.H.R.A.; Malina, O. (2012). Knowledge, attitude and practices regarding food hygiene and sanitation of food handlers in Kuala Pilah, Malaysia. *Food Control*, 27, 289–293.

Nora M. A., Priyadarshini, A. & Jaiswal, A.K. (2017). Knowledge of food safety and food handling practices amongst food handlers in the Republic of Ireland. *Food Control*. doi:10.1016/j.foodcont.2017.05.020

- Noraziah, A. and Mohd-Azlan, A. (2012). The food consumption and eating behaviour of Malaysian urbanites: Issues and concerns. *Geografia OnlineTM Malaysia Journal of Society and Space* 8 issue 6 (157 – 165)
- Norrakiah, A.S.; Siow, O.N. (2014) Knowledge, attitudes and practices of food handlers on food safety in food service operations at the Universiti Kebangsaan Malaysia. *Food Control*, 37, 210–217.
- Olsen SJ1, MacKinnon LC, Goulding JS, Bean NH, & Slutsker L. (2000). Surveillance for foodborne-disease outbreaks--United States, 1993-1997. *MMWR CDC Surveill Summ*. 2000 Mar 17;49(1):1-62.
- Omemu A.M, Obadina O. A, Taiwo G.J, Obuotor T.M.. Microbiological Assessment and Prevalence of Food Borne Pathogens in Street Vended *Wara* - Nigerian White Cheese. *American Journal of Food and Nutrition*. 2014; 2(4):59-62. doi: 10.12691/ajfn-2-4-2.
- Osaili, T.M., Obeidat, B.A., Abu Jamous, D.O. & Bawadi, H.A. (2011). Food safety knowledge and practices among college female students in North Of Jordan. *Food Control*, 22(2), 269-276
- Park, S.-H., Kwak, T.-K., & Chang, H.-J. (2010). Evaluation of the food safety training for food handlers in restaurant operations *Nutrition research and practice*, 4(1), 58–68. doi:10.4162/nrp.2010.4.1.58.
- Parry, C. M. and Beeching, N. J. 2009. Treatment of enteric fever. *British Medical Journal* 338: 1340-1341.

"Personal Hygiene." (2018) The Gale Encyclopedia of Senior Health: A Guide for Seniors and Their Caregivers. Retrieved from Encyclopedia.com: <https://www.encyclopedia.com/caregiving/encyclopedias-almanacs-transcripts-and-maps/personal-hygiene>

Rosnani, A.H.; Son, R.; Mohhidin, O.; Toh, P.S.; Chai, L.C. (2014). Assessment of knowledge, attitude and practices concerning food safety among restaurant workers in Putrajaya, Malaysia. *Food Sci. Qual. Manag* , 32, 20–27

Rentokil. (n.d.) Food Safety in Malaysia. Retrieved from <https://www.rentokil.com.my/food-safety/>

Santacruz, S. (2016). Food Safety and the Different Types of Food Contamination. Australian Institute of Food Safety. Retrieved from <https://www.foodsafety.com.au/resources/articles/ood-safety-and-the-different-types-of-food-contamination>

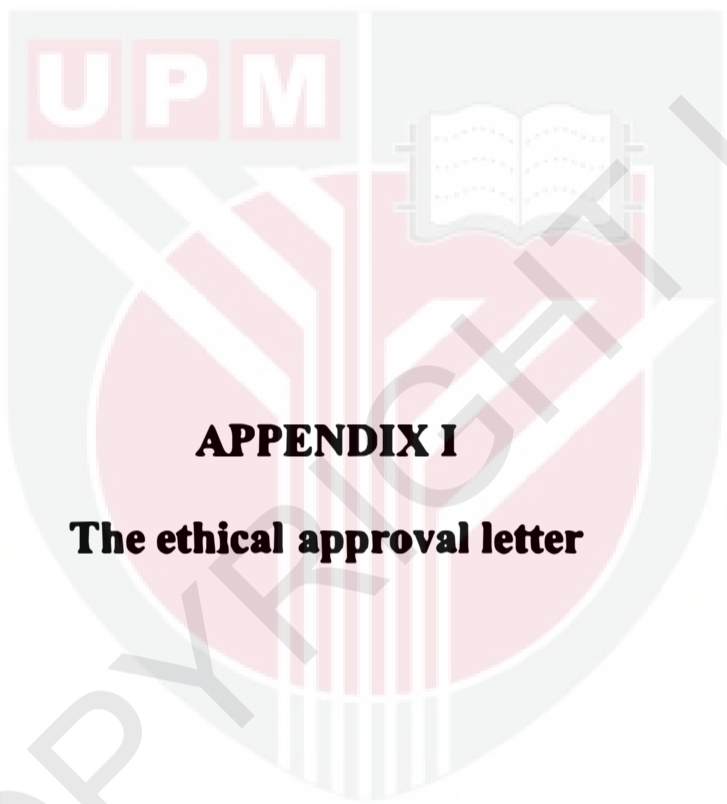
Sharifa Ezat, W.P., Netty, D. & Sangaran, G. 2013. Paper review of factors, surveillance and burden of food borne disease outbreak in Malaysia. *Malaysian Journal of Public Health Medicine*, 13(2): 98-105.

Schweihofer, J., Wells, S. (2013). Biological, chemical and physical hazards assessed with HACCP. MSU Extension. Michigan State University. Retrieved from https://www.canr.msu.edu/news/biological_chemical_and_physical_hazards_assessed_with_haccp

Soon, J. M., Singh, H. and Baines, R. (2011). Foodborne diseases in Malaysia: A review. *Food Control* 22: 823-830.

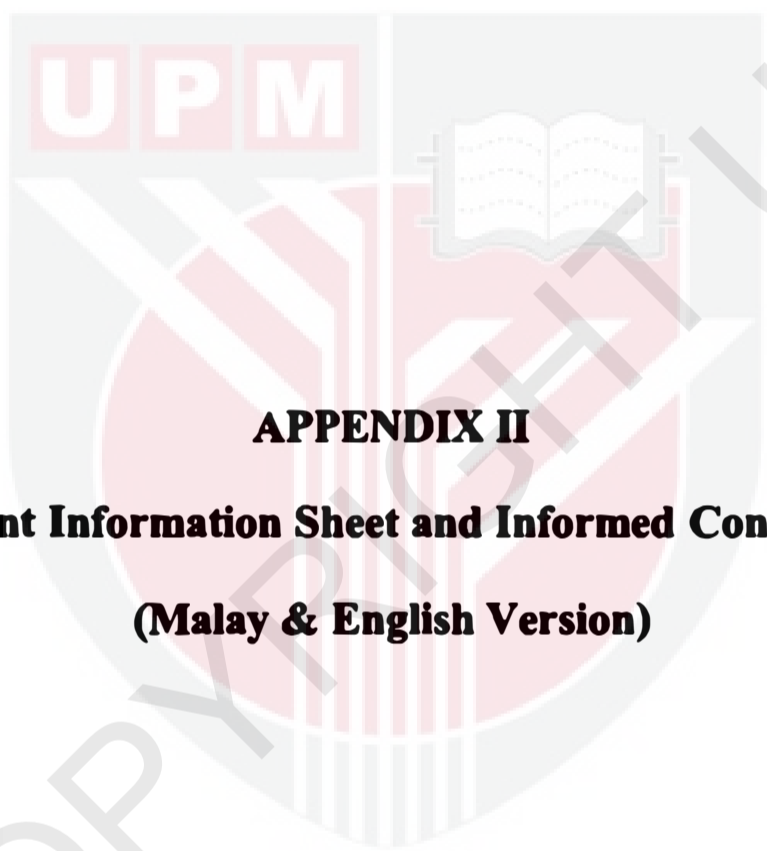
- Tan, S. L., Fatimah, A. B., Muhammad Shahrin, A. K., Lee, H. Y., & Nor Ainy, M. (2013). Hand hygiene knowledge, attitude and practices among food handlers at primary schools in Hulu Langat district, Selangor (Malaysia). *Food Control* 34. 428-435.
- Thuan, V. H., Le, N. H., Le, A. T. N., Minh, N. N. T., & Pekka Nuorti. (2015). Knowledge, Attitudes, Practices and Training Needs of Food-Handlers in Large Canteens in Southern Vietnam. *Food Control*, 57.
- Unilever Food Solution. (2019). Personal Hygiene Kitchen Safety Tips. Retrieved from <https://www.unileverfoodsolutions.com.my/en/chef-inspiration/food-safety/personal-hygiene-kitchen-safety-tips.html>
- US Food Safety. (2019). Food Poisoning (Shigella). *U.S. Department of Health & Human Services -200 Independence Avenue, S.W. - Washington, D.C. 20201.* Retrieved from: <https://www.foodsafety.gov/poisoning/causes/bacteriaviruses/shigella/index.html>
- Wilcock A, Pun M, Khanona J, et al. Consumer attitudes, knowledge and behaviour: a review of food safety issues. *Trends in Food Science & Technology*. 2004;15(2):56–66.
- Woh, P. Y., Thong, K. L., Behnke, J. M., Lewis, J. W. & Siti Nursheena, M. Zain. (2016). Evaluation of basic knowledge on food safety and food handling practices amongst migrant food handlers in Peninsular Malaysia. *Food Control*.

- Woh, Pei Yee & Thong, Kwai Lin & Ai Lian Lim, Yvonne & Marian Behnke, Jerzy & Watkin Lewis, John & Mohd Zain, Siti Nursheena. (2017). Microorganisms as an Indicator of Hygiene Status Among Migrant Food Handlers in Peninsular Malaysia. *Asia Pacific Journal of Public Health*
- World Health Organization. (2014). Global Health Observatory (GHO) Mortality and Global Health estimate. Retrieved from <http://apps.who.int/gho/data/view.wrapper.MGHEMORTCAUSE10-2012?lang=en&menu=hide>
- World Health Organisation (WHO). (2016). *Food safety*. Geneva, Switzerland: Department of Food Safety, Zoonoses and Food Borne Diseases- World Health Organization.
- World Health Organization (WHO). (2015) Regional Office for South-East Asia, Indraprastha Estate, Mahatma Gandhi Marg, New Delhi 110 002, India
- World Health Organization. (2015) Regional Office for South-East Asia, Indraprastha Estate, Mahatma Gandhi Marg, New Delhi 110 002, India
- Yanagi, D., de Vries, G. C., Rahardjo, D., Alimsardjono, L., Wasito, E. B., De I., Kinoshita, S., Hayashi, Y., Hotta, H., Osawa, R., Kawabata, M. and Shirakawa, T. (2009).. Emergence of fluoroquinolone-resistant strains of *Salmonella Enterica* in Surabaya, Indonesia. *Diagnostic Microbiology and Infectious Disease* 64(4): 422-426.
- Zulfakar, Siti & Hidayah Abd. Hamid, Nur & Sahani, Mazrura. (2018). Microbiological Assessment of Food Contact Surfaces in Residential College Cafeterias at a Local University in Malaysia. *Jurnal Sains Kesihatan Malaysia*. 16. 33-38. 10.17576/jskm-2018-1602-08.



APPENDIX I
The ethical approval letter

UPM



APPENDIX II

Participant Information Sheet and Informed Consent Form

(Malay & English Version)

© COPY UPM

BORANG 2.4: PENERANGAN DAN PERSETUJUAN RESPONDEN

Sila baca maklumat berikut dengan teliti. Sekiranya anda mempunyai sebarang pertanyaan, sila kemukakan kepada penyelidik.

1.TAJUK KAJIAN

Penilaian Dan Kesedaran Kebersihan Peribadi Pengendali Makanan Restoran di Ampang (Selangor, Malaysia)

2. PENGENALAN

Pada masa kini, makanan siap telah menjadi keperluan kerana kadar hidup yang cepat. Makanan dan budaya makan masyarakat bandar telah melalui beberapa bentuk transformasi. Di Malaysia, had masa yang singkat untuk kebanyakan orang menyediakan makanan untuk diri mereka sendiri menyebabkan peningkatan permintaan untuk makanan dari pelbagai restoran makanan. Permintaan ini juga menyediakan ruang untuk lebih ramai usahawan membuka perniagaan mereka dalam industri perkhidmatan makanan. Walau bagaimanapun, industri ini mempunyai risiko yang tinggi dalam kehadiran penyakit bawaan makanan disebabkan oleh persediaan tidak bersih dan kurangnya tahap kesedaran mengenai kebersihan peribadi pengendali makanan. Hal ini kerana pengendali makanan bertanggungjawab menyediakan makanan yang selamat untuk pelanggan mereka. Apabila pengendali makanan tidak mengamalkan kebersihan peribadi yang sewajarnya semasa penyediaan makanan, mereka boleh menjadi mekanisme untuk mikroorganisma tersebar di makanan melalui tangan mereka dan menyebabkan penyakit bawaan makanan.

3. APAKAH YANG PERLU ANDA LAKUKAN?

Anda perlu menjawab borang soal selidik. Borang soal selidik akan dibaca oleh penyelidik dan anda diminta menjawab mengikut soalan yang diberikan. Anda juga akan diminta untuk menunjukkan tangan anda untuk dilap bagi tujuan penilaian kebersihan diri.

4. SIAPA YANG TIDAK BOLEH MENYERTAI KAJIAN INI?

Responden yang mempunyai syarat berikut dikecualikan daripada menyertai kajian ini:

- i. Pengendali makanan yang sakit.

5. APAKAH FAEDAH MENYERTAI KAJIAN INI?

a) KEPADA ANDA SEBAGAI PESERTA?

Kajian ini akan memberikan pengetahuan kepada responden mengenai tahap kesedaran kebersihan peribadi pengendali makanan restoran.

b) KEPADA PENYELIDIK?

Kajian ini akan menjadi kajian perintis tentang tahap kesedaran kebersihan peribadi pengendali makanan restoran di Ampang.

6. ADAKAH IA BERISIKO?

Tiada risiko yang boleh dijangkakan untuk mengambil bahagian dalam kajian ini selain daripada yang ditemui dalam kehidupan sehari-hari. Walau bagaimanapun, kemungkinan penyiasatan lanjut akan dilakukan jika pencemaran bakteria ditemui dari tangan.

7. ADAKAH MAKLUMAT DAN IDENTITI SAYA KEKAL RAHSIA?

Semua maklumat yang diperolehi melalui soal selidik dan borang maklumat responden adalah sulit dan tidak akan didedahkan kepada mana-mana pihak ketiga. Soal selidik yang lengkap akan dikodkan menggunakan kod pengenalan unik. Butiran individu tidak akan dimasukkan di mana-mana bahagian notis penyelidikan dan penerbitan. Jika anda diminta untuk mengetahui hasil penyelidikan ini, kami senang memberikan hasilnya.

8. SIAPA YANG SAYA PERLU HUBUNGI SEKIRANYA SAYA MEMPUNYAI SOALAN TAMBAHAN SEMASA MENGIKUTI PENYELIDIKAN INI?

Untuk sebarang maklumat lanjut, sila hubungi:

i. Prof Madya Sarva Mangala Praveena
Jabatan Kesihatan Persekitaran dan Pekerjaan
Fakulti Perubatan dan Sains Kesihatan
Universiti Putra Malaysia
43400 UPM Serdang

Nombor telefon: 03-89472692
Nombor faks: 03-89472395
E-mel: smpraveena@upm.edu.my

ii. Cik Abyan Hazimah Binti Kamaludin
Jabatan Kesihatan Persekitaran dan Pekerjaan
Fakulti Perubatan dan Sains Kesihatan
Universiti Putra Malaysia
43400 UPM Serdang

Nombor telefon: 017-8817836
Emel: abyanhazimah8@gmail.com

Sila tandatangan di sini sekiranya anda telah membaca dan memahami kandungan halaman ini _____

9. PERSETUJUAN

Saya..... No Kad Pengenalan.
beralamat.....
.....dengan ini bersetuju untuk mengambil bahagian secara sukarela dalam penyelidikan yang tersebut di atas *(kajian klinikal/percubaan ubat-ubatan/rakaman video/kumpulan sasaran/temuduga/ soal selidik).

Saya telah diberi penjelasan secara menyeluruh mengenai penyelidikan ini dari segi metodologi, risiko dan komplikasi (seperti tertulis pada Helaiian Penerangan Responden). Saya memahami bahawa saya berhak menarik diri dari penyelidikan ini pada bila-bila masa tanpa memberi sebarang alasan.Saya juga memahami bahawa sebarang maklumat yang berkaitan identiti saya akan dirahsiakan.

Saya* berminat / tidak berminat untuk mengetahui keputusan kajian yang melibatkan saya.

I setuju/tidak bersetuju untuk imei/gambar/rakaman video/ rakaman suara digunakan dalam apa jua bentuk penerbitan atau pembentangan. (sekiranya berkaitan).

*potong yang tidak berkenaan

Tandatangan Tandatangan
(Responden) (Saksi)

Tarikh :..... Nama :.....

No. K/P:

Saya mengesahkan bahawa saya telah menerangkan kepada responden ini sifat dan tujuan penyelidikan yang tersebut di atas.

Tarikh Tandatangan
(Penyelidik)

FORM 2.4: RESPONDENT'S INFORMATION SHEET AND INFORMED CONSENT FORM

Please read the following information carefully and do not hesitate to discuss any questions you may have with the researcher.

1. STUDY TITLE :

Personal Hygiene Assessment and Awareness of Restaurant Food Handlers In Ampang (Selangor, Malaysia)

2. INTRODUCTION:

Nowadays, ready to eat or prepared food has become a necessity due to fast pace of living. Food and the culture of eating of the urban society has undergone some form of transformation. In Malaysia, time limitation for most people to prepare meals for themselves has increased the demand for food consumption from various food restaurant. The demand also has provided space for more entrepreneurs to open their businesses in the food service industry. However, this industry has a high risk in the emergence of food borne disease due to unhygienic preparation and lack of awareness level on personal hygiene of food handlers. This is because food handlers are responsible in providing safe food for the intake of their customers. When food handler do not practice proper personal hygiene during food preparation, they can be a mechanism for microorganisms to spread on the food through their hands and cause foodborne disease.

3. WHAT WILL YOU HAVE TO DO?

You need to answer the questionnaire. The questionnaire will be read by the researcher and you will be asked to answer the questions given. You will also be asked to show your hands and hand swabbing will be done for the purpose of personal hygiene assessment.

4. WHO SHOULD NOT PARTICIPATE IN THE STUDY?

Respondents with the following conditions are exempt from participating in this study:

- i. Food handler who is sick.

5. WHAT WILL BE THE BENEFITS OF THE STUDY:

(a) TO YOU AS THE SUBJECT?

This study will provide the respondents with knowledge about the level of personal hygiene awareness of restaurant food handlers.

(b) TO THE INVESTIGATOR?

This study will update information of the bacterial contaminant (*Salmonella Typhi*, *Shigella species* and *Escherichia coli*) in restaurant food handlers together with awareness levels.

6. WHAT ARE THE POSSIBLE RISKS?

There is no risk expected in everyday life by participating in this study. However, possible further investigation will be done if bacterial contaminants are found from hand swabbing.

7. WILL THE INFORMATION THAT YOU PROVIDE AND YOUR IDENTITY REMAIN CONFIDENTIAL?

All information obtained through the questionnaire and the informational form is confidential and will not be disclosed to any third party. Complete questionnaires will be encoded using unique identification codes. Individual details will not be included in any part of the research and publication notices. If you are asked to know the results of this investigation, we are pleased to provide you with the results

8. WHO SHOULD YOU CONTACT IF YOU HAVE ADDITIONAL QUESTIONS DURING THE COURSE OF THE RESEARCH?

iii. ASSOC. PROF. DR SARVA MANGALA PRAVEENA

Department Of Environmental And Occupational Health
Faculty Of Medicine And Health Sciences
Universiti Putra Malaysia
43400 UPM Serdang

Telephone Number: 03-89472692

Fax Number: 03-89472395

E-mail: smpraveena@upm.edu.my

iv. Cik Abyan Hazimah Binti Kamaludin

Department Of Environmental And Occupational Health
Faculty Of Medicine And Health Sciences
Universiti Putra Malaysia
43400 UPM Serdang

Telephone Number: 017-8817836

Email: abyanhazimah8@gmail.com

Please initial here if you have read and understood the contents of this page_____

9. CONSENT

I Identity Card No.
address.....

.....hereby voluntarily agree to take part in
the research stated above *(clinical /drug trial/video recording/ focus group/interview-based/
questionnaire-based).

I have been informed about the nature of the research in terms of methodology, possible
adverse

effects and complications (as written in the Respondent's Information Sheet). I understand
that I have the right to withdraw from this research at any time without giving any reason
whatsoever. I also understand that this study is confidential and all information provided with
regard to my identity will remain private and confidential.

I* wish / do not wish to know the results related to my participation in the research

I agree/do not agree that the images/photos/video recordings/voice recordings related to me
be used in any form of publication or presentation (if applicable)

* delete where necessary

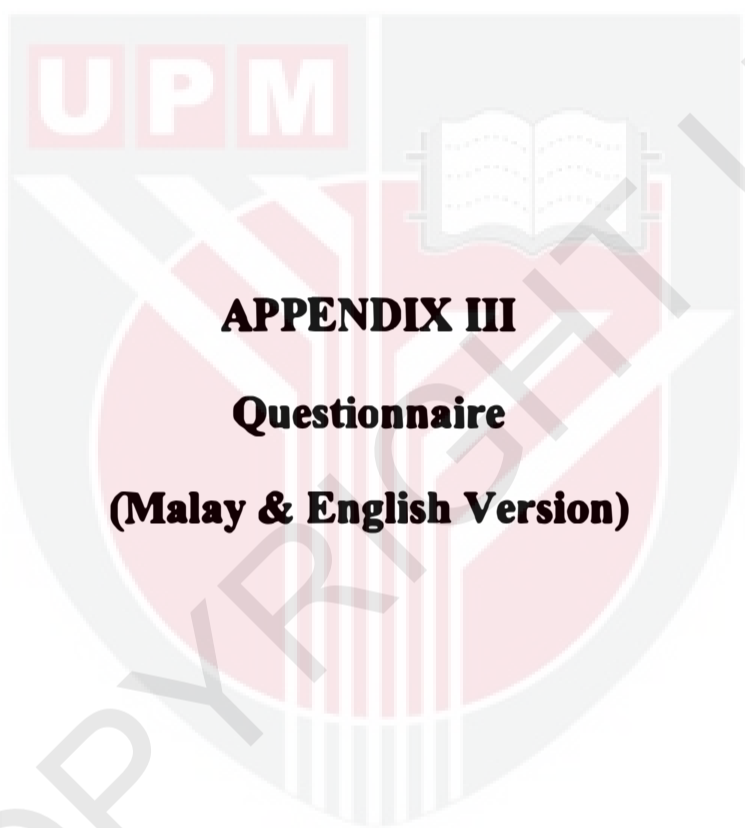
Signature Signature
(Respondent) (Witness)

Date : Name :

I/C No. :

I confirm that I have explained to the respondent the nature and purpose of the above-
mentioned research.

Date Signature
(Researcher)



APPENDIX III
Questionnaire
(Malay & English Version)

© COPYRIGHT © UPM



**Jabatan Kesihatan Persekitaran dan Pekerjaan
Fakulti Perubatan dan Sains Kesihatan
Universiti Putra Malaysia**

Tajuk:

**PENILAIAN DAN KESEDARAN KEBERSIHAN PERIBADI PENGENDALI MAKANAN RESTORAN
DI AMPANG (SELANGOR, MALAYSIA)**

Arahan Borang Soal Kaji Selidik

Borang soal kaji selidik ini mempunyai 4 bahagian:

Bahagian 1: Maklumat sosio-demografi

Bahagian 2: Pengetahuan terhadap kebersihan peribadi

Bahagian 3: Sikap terhadap kebersihan peribadi

Bahagian 4: Amalan kebersihan peribadi

Responden dikehendaki menjawab semua soalan di dalam boring soal kaji selidik ini dan sila tandakan jawapan di dlam ruangan kotak yang disediakan. Semua jawapan adalah sulit dan peribadi, hanya untuk kegunaan kajian.

Sila kembalikan borang soal kaji selidik kepada penyelidik setelah selesai.

Bahagian 1: Maklumat sosio-demografi

Umur	_____ Tahun	
Jantina	Lelaki / Perempuan	
Kewarganegaraan/Negara	_____	
Status	Bujang / Berkahwin / Bercerai / Duda	
Tahap pendidikan	Rendah / Menengah / Universiti / Tiada pendidikan formal	
Status pekerjaan	Tetap / Sementara / Kontrak/ Permit pekerjaan	
Jenis pekerjaan	<input type="checkbox"/> Tukang masak <input type="checkbox"/> Pelayan Bar <input type="checkbox"/> Juruwang <input type="checkbox"/> Pelayan <input type="checkbox"/> Tukang cuci <input type="checkbox"/> Pengurus / penyelia <input type="checkbox"/> <1 tahun <input type="checkbox"/> 1 – 5 tahun <input type="checkbox"/> 6 – 10 tahun <input type="checkbox"/> >10 tahun	
Tempoh bekerja (Tahun)		
Penyertaan dalam latihan / kursus keselamatan makanan	Ya / Tidak	
Jika Ya, anjuran Latihan/kursus keselamatan makanan	Kerajaan/Swasta/ restoran/sendiri	Tajaan
Jika Ya, kekerapan menyertai latihan / kursus keselamatan makanan dalam setahun	_____	
Jika ya, bilakah latihan keselamatan makanan terakhir yang dihadiri	_____	
Adakah anda mengambil suntikan vaksin kepala?	Ya / Tidak	
Jika Ya, bilakah suntikan vaksin kepala yang terakhir	<input type="checkbox"/> <1 tahun lalu <input type="checkbox"/> 1 - 3 tahun lalu <input type="checkbox"/> >3 tahun lalu	
Penggunaan alat pelindung diri	(i) Sarung tangan - Ya / Tidak (ii) Baju bersih - Ya / Tidak (iii) Kasut - Ya / Tidak (iv) Penutup kepala - Ya / Tidak	
Konsumer alkohol	Ya / Tidak	

Secara umum, apa kesan penyakit makanan yang berkaitan dengan jangkitan tangan yang tercemar kepada pengguna?

- Sangat rendah
- Rendah
- Tinggi
- Sangat tinggi

Apakah keberkesanan kebersihan tangan peribadi dalam meminimumkan / mencegah kesan penyakit makanan yang berkaitan dengan jangkitan tangan yang tercemar pada pengguna

- Sangat rendah
- Rendah
- Tinggi
- Sangat tinggi

Di antara semua faktor yang berkaitan dengan mengurangkan / mencegah penyakit makanan, berapa tahap kepentingan kebersihan tangan peribadi di restoran anda?

- Sangat rendah
- Rendah
- Tinggi
- Sangat tinggi

Dalam purata, berapa peratus sebenarnya yang dilakukan oleh pekerja anda di restoran untuk menjaga kebersihan tangan peribadi dengan membasuh tangan (antara 0 dan 100%)?

- _____%
- 0 Saya tidak tahu

Bahagian 2: Pengetahuan terhadap kebersihan peribadi

Kenyataan		Ya	Tidak	Tidak Pasti
Kefahaman				
1	Pengetahuan kebersihan yang baik adalah penting untuk mencegah penyakit makanan			
2	Adakah tahap kesedaran anda dalam meminimumkan / mencegah penyakit makanan dengan memperbaiki amalan kebersihan tangan peribadi anda meningkat dengan menyertai promosi kebersihan tangan sebelum ini?			
3	Basuh tangan dengan betul mengurangkan risiko pencemaran			
4	Pencemaran silang ialah pemindahan mikroorganisma berbahaya dari makanan ke tangan semasa pengendalian makanan dengan tangan mentah.			
5	Bakteria patogen boleh didapati di permukaan kulit manusia			
6	Keracunan makanan / pencemaran boleh disebabkan oleh bakteria patogen yang ditemui di tangan yang dipindahkan dari tangan ke makanan			
7	Memahami sumber bakteria patogen yang boleh didapati di tangan.			
8	Bakteria patogen boleh dilihat melalui mata anda.			
Kebersihan diri				
1	Pekerja restoran harus mencuci tangan mereka dengan kerap			
2	Mengetahui bahawa tangan perlu dibasuh sekurang-kurangnya 15 saat.			
3	Teknik mencuci tangan yang betul mempunyai 5 langkah			
4	Adakah cukup hanya dengan membasuh tangan anda di bawah air yang mengalir untuk menghilangkan bakteria sebelum menyentuh makanan?			
5	Adakah sabun wajib digunakan dalam mencuci tangan?			
6	Adakah sabun antibakteria wajib digunakan ketika membasuh tangan?			
7	Air sejuk harus digunakan semasa aktiviti mencuci tangan.			
8	Tangan perlu dikeringkan selepas dibasuh			
9	Kuku jari yang pendek akan mengurangkan pencemaran semasa penyediaan makanan			
10	Pekerja harus mengelakkan menyentuh rambut mereka selepas mencuci tangan semasa penyediaan makanan.			
11	Elakkan menyentuh makanan siap sedia dengan tangan.			
12	Cincin, jam tangan dan gelang tangan harus dibuka semasa cuci tangan			

13	Pergelangan tangan harus dicuci semasa mencuci tangan			
Kenyataan		Ya	Tidak	Tidak Pasti
14	Tidak boleh terlibat dalam penyediaan makanan apabila anda sakit			

Bahagian 3: Sikap terhadap kebersihan peribadi

	Kenyataan	Tidak Pernah	Jarang	Kadang-kala	Kerap	Selalu
1	Pengendalian makanan yang selamat merupakan sebahagian penting dari tanggungjawab pekerjaan saya.					
2	Saya akan mengubah tingkah laku pengendalian makanan saya apabila saya tahu ia tidak betul.					
3	Saya bersedia mendapatkan lebih banyak pengetahuan keselamatan makanan.					
4	Saya bersedia menghadiri latihan mengenai kebersihan diri.					
5	Saya percaya bahawa kebersihan diri yang baik boleh menghalang penyakit bawaan makanan.					
6	Saya akan mengambil cuti ketika sakit atau demam.					
7	Menggunakan topi, topeng, sarung tangan pelindung dan pakaian yang mencukupi mengurangkan risiko keracunan makanan melalui tangan yang tercemar.					
8	Saya merasa membasuh tangan sebelum mengendalikan makanan mentah atau dimasak mengurangkan risiko keracunan makanan.					
9	Pengendali makanan dengan luka pada jari dan tangan tidak seharusnya mengendalikan makanan.					
10	Saya menggunakan kain bersih yang berbeza untuk memasak meja dan peralatan makanan.					

Bahagian 4: Amalan kebersihan peribadi

	Kenyataan	Tidak Pernah	Jarang	Kadang-kala	Kerap	Selalu
1	Adakah anda menerima latihan formal tentang kebersihan tangan dalam tempoh tiga tahun yang lalu?					
2	Bagaimanakah anda mempertimbangkan usaha yang anda perlukan untuk melakukan amalan kebersihan tangan peribadi yang baik?					
3	Adakah anda mengamalkan prosedur mencuci tangan yang betul?					
4	Adakah penggunaan sabun menjadikan kebersihan tangan peribadi lebih mudah untuk dilatih dalam kerja harian anda?					
5	Adakah anda membasuh tangan apabila kembali dari tandas?					
6	Adakah anda membasuh tangan anda selepas menyapu hidung atau menggaru badan anda?					
7	Adakah anda membasuh tangan apabila kembali bekerja selepas waktu rehat?					
8	Adakah anda membasuh tangan anda selepas mengendalikan sisa makanan atau sampah?					
9	Adakah anda menutup luka di tangan dengan pembalut semasa penyediaan makanan?					
10	Adakah anda menyentuh makanan apabila tangan atau jari anda tercedera dan tidak ditutup dengan betul?					
11	Adakah anda memastikan bahawa tangan anda kering dan bersih semasa mengendalikan makanan?					
12	Adakah anda memakai barang kemas ketika mengendalikan makanan?					
13	Adakah anda mengambil cuti jika anda mengalami penyakit bawaan makanan					
14	Adakah anda merokok semasa menyediakan makanan?					
15	Adakah anda memakai pakaian					

	seragam yang bersih dan sesuai sebelum memulakan kerja?					
16	Adakah anda memakai kasut yang betul sebelum memulakan kerja?					
17	Adakah anda memakai apron sebelum memulakan kerja?					
18	Adakah anda memakai penutup kepala sebelum memulakan kerja?					

	Kenyataan	Tidak Pernah	Jarang	Kadang-kala	Kerap	Selalu
19	Adakah anda memakai penutup mulut sebelum memulakan kerja?					
20	Adakah anda mengambil suntikan vaksin kepala?					
21	Adakah anda pergi pemeriksaan kesihatan perubatan setiap enam bulan?					
22	Adakah anda memakai sarung tangan apabila menyentuh makanan siap sedia?					
23	Adakah anda mencuci tangan sebelum memakai sarung tangan?					
24	Adakah anda mencuci tangan selepas membuka sarung tangan?					
25	Adakah mengetahui hasil pemerhatian kebersihan tangan di tangan anda akan membantu meningkatkan amalan kebersihan tangan anda?					

Tamat Borang Soal Selidik. Terima Kasih



**Department of Environment and Occupational Health
Fakulty of Medecine and Health Sciences
Universiti Putra Malaysia**

Title:

**PERSONAL HYGIENE ASSESSMENT AND AWARENESS OF RESTAURANT FOOD HANDLERS
IN AMPANG (SELANGOR, MALAYSIA)**

Questionnaire Instruction

This questionnaire contains four sections:
Section 1: Socio-demographic information
Section 2: Knowledge on personal hygiene
Section 3: Attitude on personal hygiene
Section 4: Practice on personal hygiene

Respondent required answering all questions in this book and please marking your answer on the boxes provided. Answers will be private and confidential, only for study purpose.

Please return this questionnaire booklet to researcher upon completion.

Section 1: Socio-demographic information

Age	_____ Years Old
Gender	Male / Female
Nationality / Country	_____
Status	Single / Married / Divorced / Widowed
Education level	Primary / Secondary / University / No formal education
Job status	Permanent / Part-time / Contract / Work Permit
Type of job	<input type="checkbox"/> Cook <input type="checkbox"/> Bartender <input type="checkbox"/> Cashier <input type="checkbox"/> Waiter <input type="checkbox"/> Cleaner <input type="checkbox"/> Manager/supervisor
Working experience (Years)	<input type="checkbox"/> <1 years <input type="checkbox"/> 1 – 5 years <input type="checkbox"/> 6 – 10 years <input type="checkbox"/> >10 years
Participation in food safety training / courses	Yes / No
If yes, food safety training / courses organized by	Government / Private / sponsored by restaurant / individual
If yes, the frequency of participating in food safety training / courses within a year	_____
If yes, when was the last food training attended	_____
Are you taking a typhoid vaccine?	Yes / No
If yes, when was the last vaccine injection?	<input type="checkbox"/> <1 year ago <input type="checkbox"/> 1 - 3 years ago <input type="checkbox"/> >3 years ago
Use of personal protective equipment	(v) Glove - Yes / No (vi) Clean shirt - Yes / No (vii) Shoe - Yes / No (viii) Cap/hair cover - Yes / No
Alcohol consumer	Yes / No
Smoking	Yes / No
Grade premises	_____
In general, what is the food illness impact associated with contaminated hand infection?	<input type="checkbox"/> Very low <input type="checkbox"/> Low

consumers?

- High
- Very high

What is the effectiveness of personal hand hygiene in minimizing/preventing food illness impact associated with contaminated hand infection on consumers

- Very low
- Low
- High
- Very high

Among all the factors associated with minimizing/preventing food illness, how important is personal hand hygiene at your restaurant?

- Very low
- Low
- High
- Very high

On average, in what percentage of requiring personal hand hygiene is actually performed either by handrubbing or handwashing by your workers at your restaurant (between 0 and 100%)?

- _____%
- 0 I don't know

Section 2: Knowledge on personal hygiene

Statement		Yes	No	Not sure
Understanding				
1	Good hygiene knowledge is important to prevent food illness.			
2	Has your awareness level in minimizing/preventing food illness by improving your personal hand hygiene practices increased by joining previous hand hygiene promotional campaign?			
3	Washing hands properly reduce risk of contamination.			
4	Cross contamination is the transfer of harmful microorganisms from food to hand during food handling with raw hand.			
5	Pathogenic bacteria can found on the human skin surface			
6	Food poisoning/contamination can be caused by pathogenic bacteria found in hand being transferred from hand to food.			
7	Understand the sources of pathogenic bacteria which can be found in hand.			
8	Pathogenic bacteria can be seen through your eye.			
Personal hygiene				
1	Restaurant workers must wash their hands often regularly.			
2	Know that hands need to be washed at least 15 seconds.			
3	The correct techniques hand washing have 5 steps			
4	Is it enough just by washing your hands under running water to remove bacteria before touching food?			

5	Is soap compulsory to be used in hand washing?			
6	Is antibacterial soap compulsory to be used in hand washing?			
7	Cold water should be used during hand washing activities.			
8	Hands need to be dried after washing			
9	Short finger nails will decrease contamination during food preparation			
10	Employees should avoid touching their hair after washing hands during food preparation.			
11	Avoid bare hand contact with ready to eat food.			
12	Rings, watch and wrist should be removed during handwashing.			
13	Wrist should be washed during handwashing.			
14	Cannot involve in food preparation when you are sick.			

Section 3: Attitude on personal hygiene

Statement		Never	Rarely	Sometimes	Often	Always
1	Personal hand hygiene is an essential part of my job responsibilities in providing safe food to consumers.					
2	I will change my personal hand hygiene behaviour when I know it is incorrect.					
3	I am willing to obtain more personal hygiene information as a part of food safety knowledge.					
4	I am willing to attend training regarding personal hygiene.					
5	I believe good personal hygiene can prevent foodborne illness.					
6	I will take leave when sick, fever or catch cold.					
7	I will use caps, masks, protective gloves and adequate clothing to reduce the risk of food poisoning through contaminated hands.					
8	I feel that washing hand before handling raw or cooked foods reduces risk of food poisoning.					
9	Food handlers with abrasion or cuts on fingers and hands should not handling foods.					
10	I use different clean clothes to					

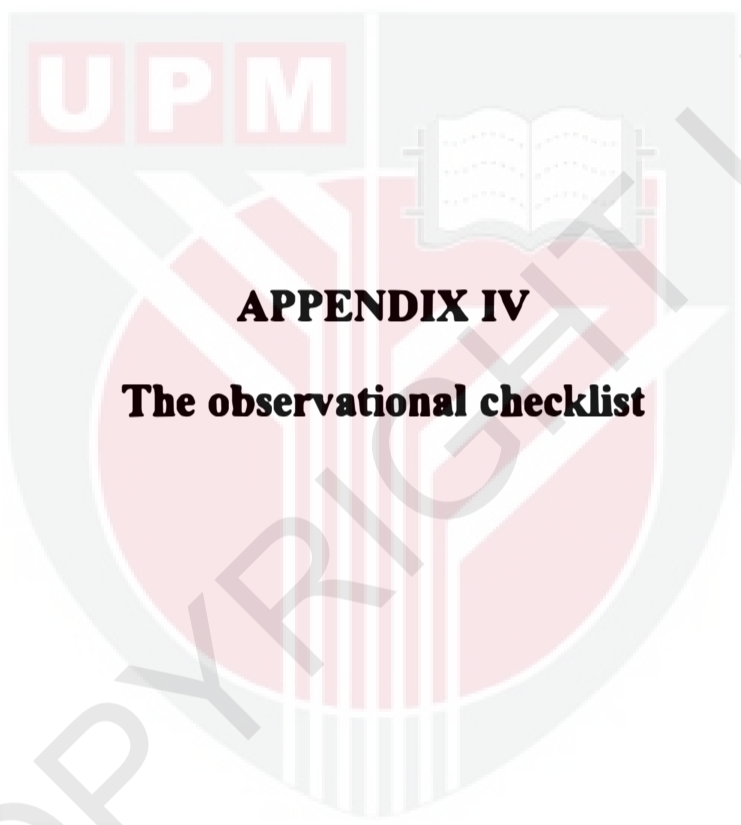
	mop dining tables and food utensils.					
--	--------------------------------------	--	--	--	--	--

Section 4: Practice on personal hygiene

Statement		Never	Rarely	Sometimes	Often	Always
1	Did you receive formal training in hand hygiene in the last three years					
2	How do you consider the effort required by you to perform good personal hand hygiene practice?					
3	Do you practise proper hand-washing procedures?					
4	Has the use of soap made personal hand hygiene easier to practice in your daily work?					
5	Do you wash your hands when returning from the toilet?					
6	Do you wash your hands after nose-wiping or scratching your body?					
7	Do you wash your hands when returning to work after break?					
8	Do you wash your hands after handling waste food or rubbish?					
9	Do you cover your wound on hands with bandages during food preparation?					
10	Do you touch food when your hands or fingers are cut and not properly covered?					
11	Do you make sure that your hands are dry and clean when handling food?					
12	Do you wear jewellery when handling food?					
13	Do you take leave if you are suffering from foodborne illness?					
14	Do you smoke when preparing food?					
15	Do you put on a clean and suitable uniform before starting work?					
16	Do you put on proper shoes before starting work?					
17	Do you put on an apron before starting work?					
18	Do you put on a cap before					

	starting work?					
19	Do you put on a mask before starting work?					
20	Do you take typhoid vaccine injection?					
21	Do you go for medical health check every six months?					
22	Do you wear gloves when touching ready-to-eat foods?					
23	Do you wash your hands before putting on gloves?					
24	Do you wash your hands after removing gloves?					
25	Did knowing the results of personal hand hygiene observation in your hand will help to improve your hand hygiene practices?					

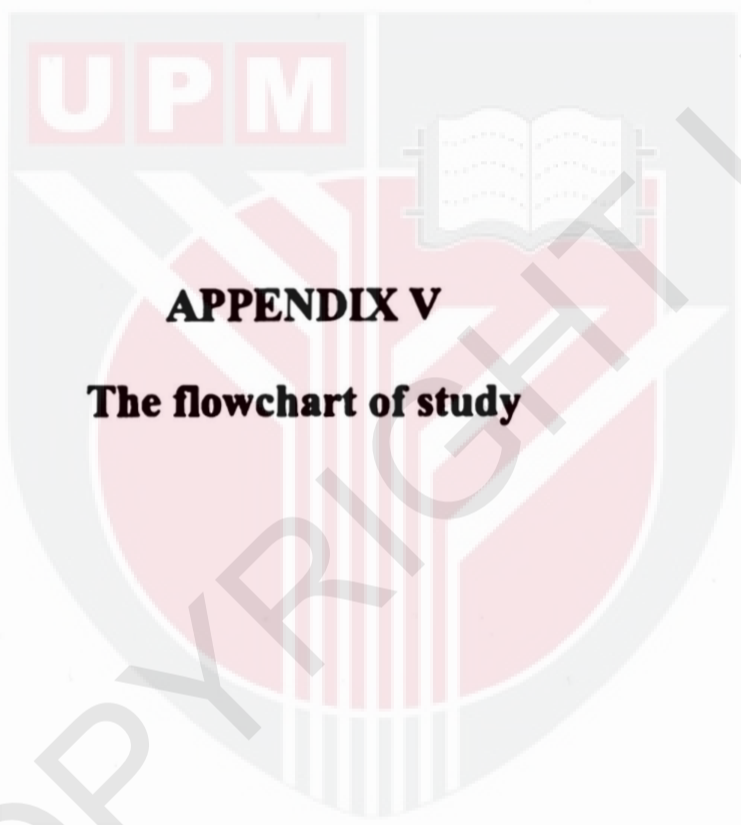
End of questionnaire. Thank you.



APPENDIX IV
The observational checklist

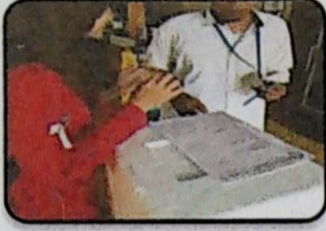
UPM

No.	Items	Yes	No
1	Food handlers wear clean and appropriate uniforms	113 (99.1%)	1 (0.9)
2	Food handler wear proper shoes	39 (34.2%)	75 (65.8%)
3	Food handler wear aprons	67 (58.8%)	47 (41.2%)
4	Food handler wear caps	70 (61.4%)	44 (38.6%)
5	Food handler wear masks	1 (0.9%)	113 (99.1%)
6	Jewellery is not worn when handling food	98 (86%)	16 (14%)
7	Hands are dry and not oily	94 (82.5%)	20 (17.5%)
8	Fingernails are short and clean	114 (100%)	0 (0%)
9	Smoking only occurs in designated areas away from food	114 (100%)	0 (0%)
10	Food handler wear gloves when handling food	2 (1.8%)	112 (98.2)
11	Food handler wash hands before using gloves or handling food	112 (98.2%)	2 (1.8%)
12	Food handler wash hands after using gloves or handling food	102 (89.5%)	12 (10.5%)
13	Food handler change gloves or wash hands between handling raw and RTE food	106 (93%)	8 (7%)
14	Food handler wash hands after returning from the toilet	114 (100%)	0 (0%)
15	Food handler wash hands using proper technique	30 (26.3%)	84 (73.7%)
16	Food handler use soap in hand-washing	11 (9.6%)	103 (90.4%)
17	Eating, drinking or chewing gum occur only in designated areas away from food preparation	114 (100%)	0 (0%)
18	Food handler with infections are restricted/excluded	114 (100%)	0 (0%)
19	Food handler wash hands after nose-wiping or scratching body parts	65 (57%)	49 (43%)
20	Food handler wash hands when returning to work after break	113 (99.1%)	1 (0.9%)
21	Food handler wash hands after handling waste food or rubbish	113 (100%)	1 (0.9%)
22	Open sores, cuts or splints/bandages are completely covered when handling food	111 (97.4%)	3 (2.6%)
23	Food handler use different clean clothes to mop dining tables and food utensils.	114 (100%)	0 (0%)
24	Food handler smoke when preparing food	114 (100%)	0 (0%)



APPENDIX V
The flowchart of study

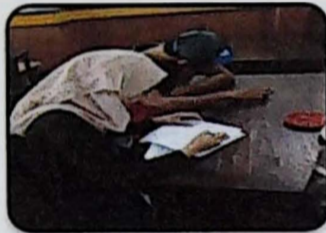
UPM



Food handler was approached and permission was asked to conduct study



Hand swabbing were conducted on the hands of food handler. Cotton buds were kept in 5ml of peptone alkaline water as a transport medium to the laboratory for immediate laboratory analysis.



Then the food handlers were interviewed by trained researcher to answer the questionnaires regarding the awareness level on personal hygiene.



The samples were vortexed for 10 seconds to release bacteria from the cotton swab.



For dilution to detect Salmonella and Shigella, 0.1ml of specimen were added into 9.9ml of peptone alkaline water and vortexed it. Dilution method for the detection of Escherichia coli, 1ml of specimen were added into 9.9ml of peptone alkaline water.



1 ml of the mixture were poured on the XLD agar for Salmonella and Shigella and 1ml of mixture were poured on emb agar for detection of Escherichia coli.



Plates were aerobically incubated at 37 °C for 24 hours for evidence of microbial growth.



On xylose lysine deoxycholate (XLD) agar plate, Salmonella spp. appeared as red colonies with black centers and Shigella spp. also appear red. Meanwhile Escherichia coli on eosin methylene blue (EMB) agar plate appear in the formation of the green metallic sheen.

UPM




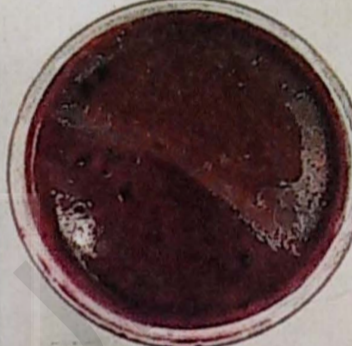



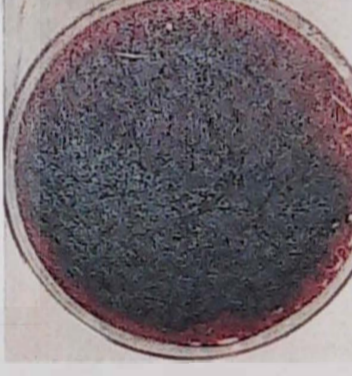






APPENDIX II

The result of bacterial contaminants assessment




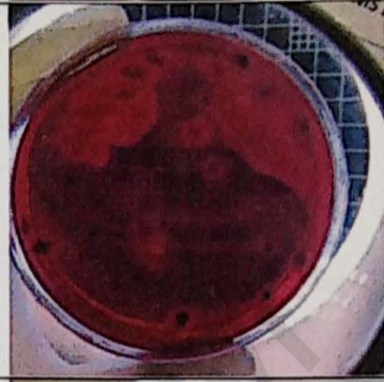






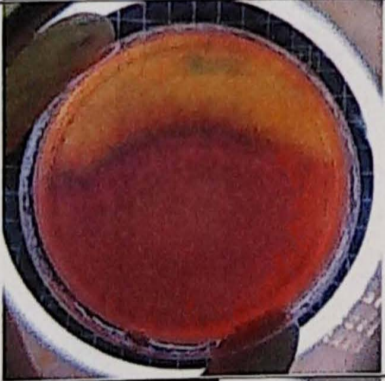
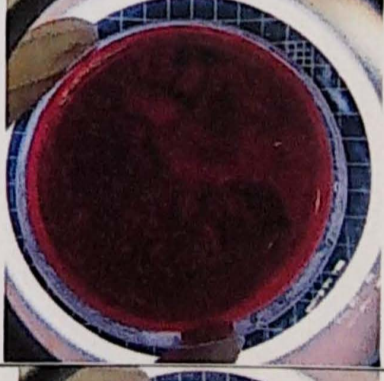

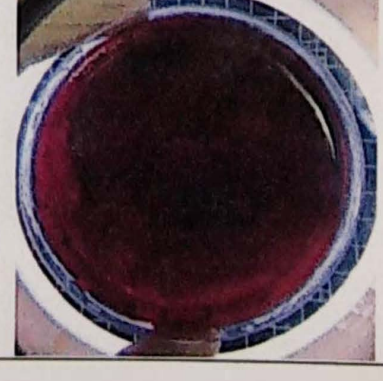
UPM

The screening of bacteria occurrence presence in food handlers

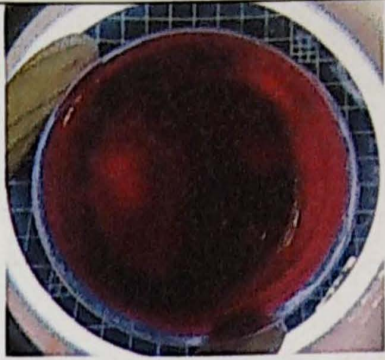
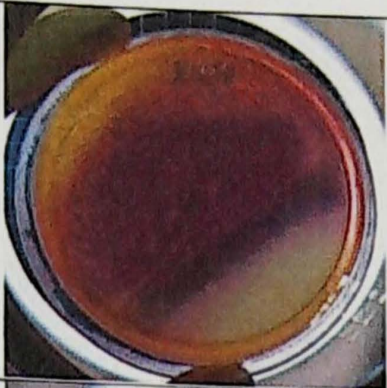
Food Handler	XLD agar	EMB agar
1		
2		
3		
4		
5		
6		

7				
8				
9				
10				
11				
12				
13				

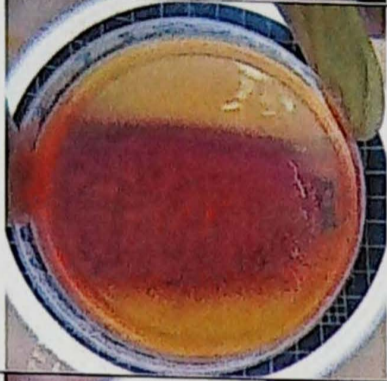
14		
15		
16		
17		
18		
19		
20		

21		
22		
23		
24		
25		
26		
27		

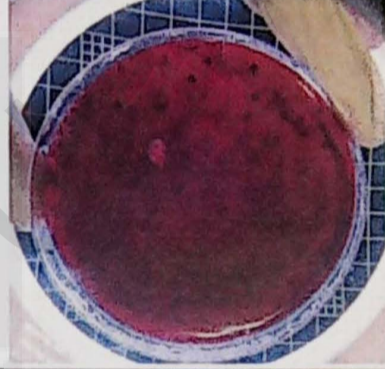
28



29



30



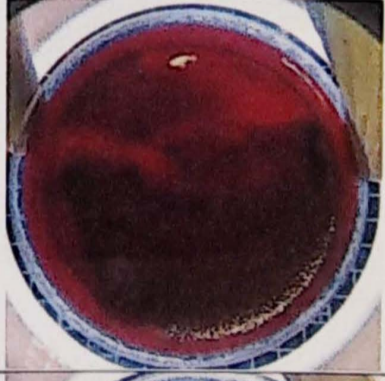
31



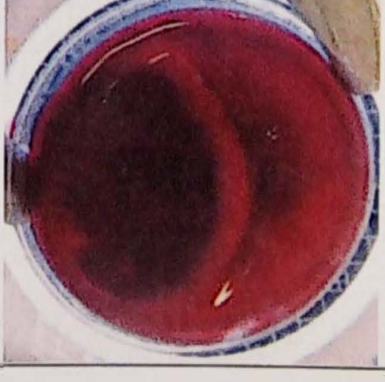
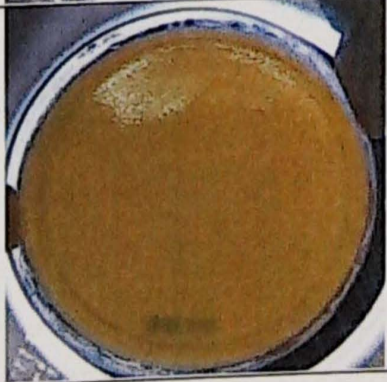
32

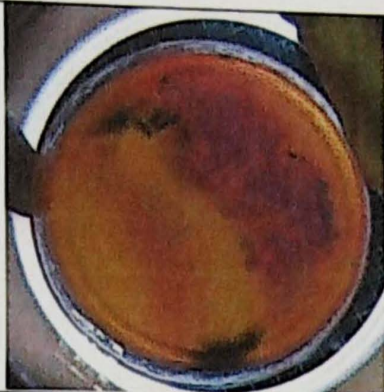

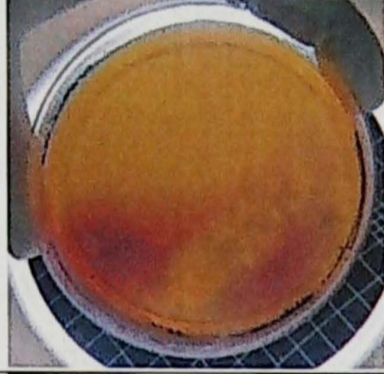





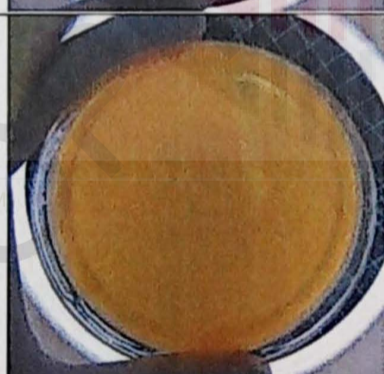

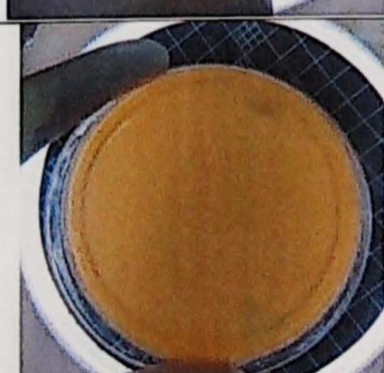
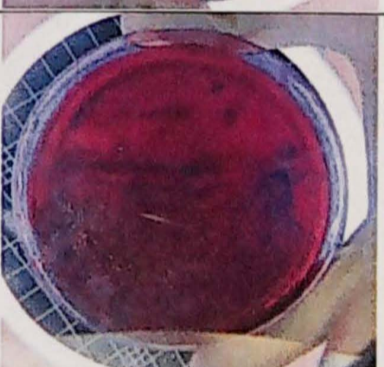
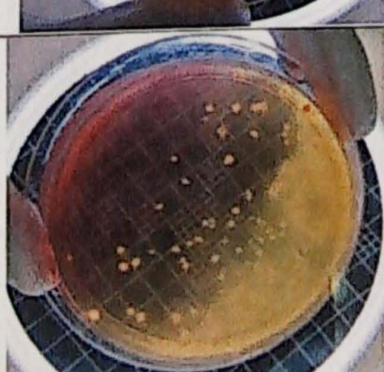







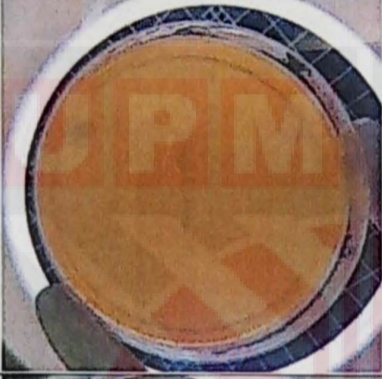
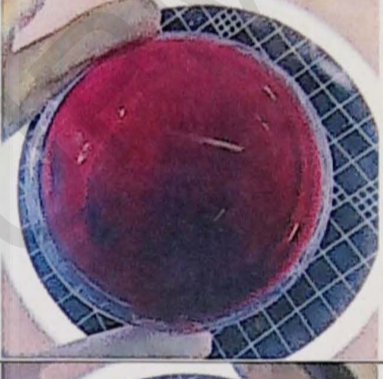
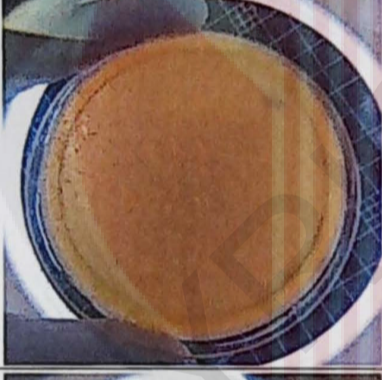

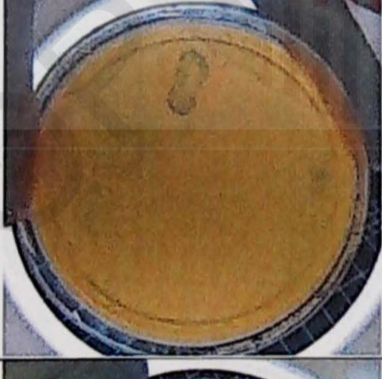
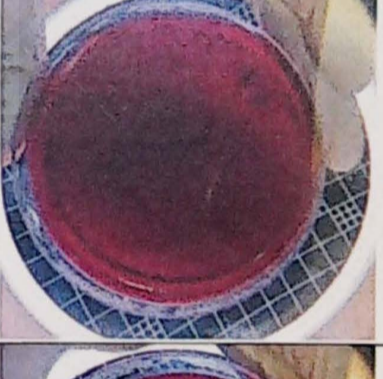

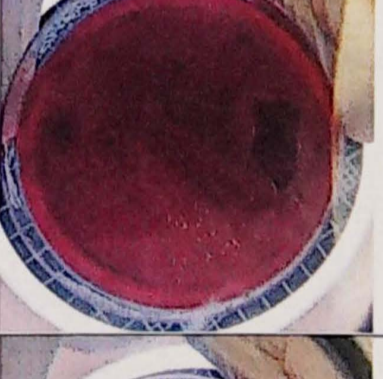

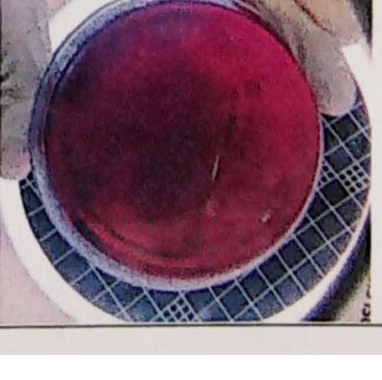
33

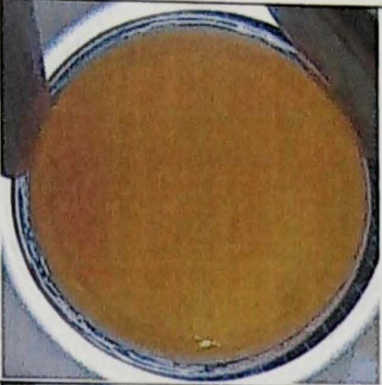
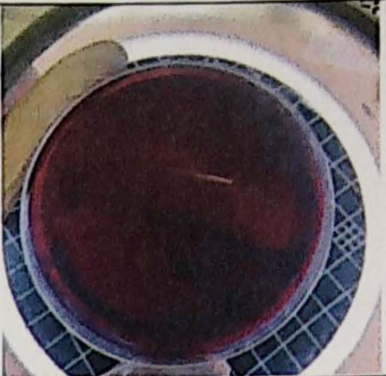

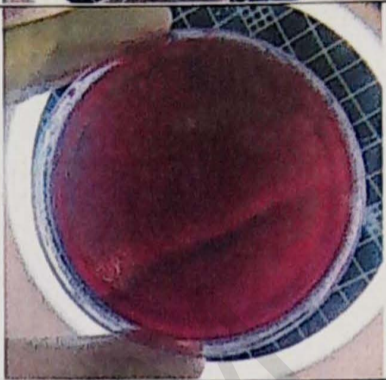

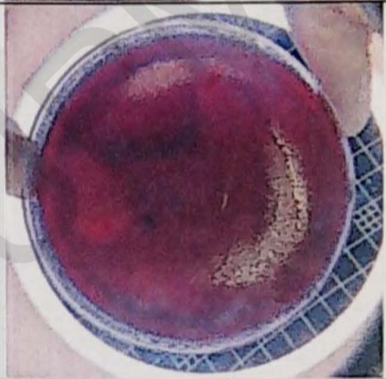


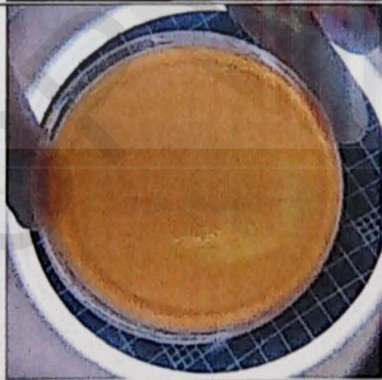


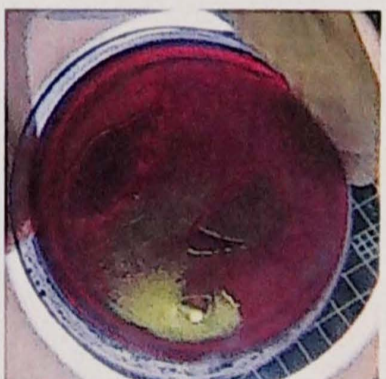





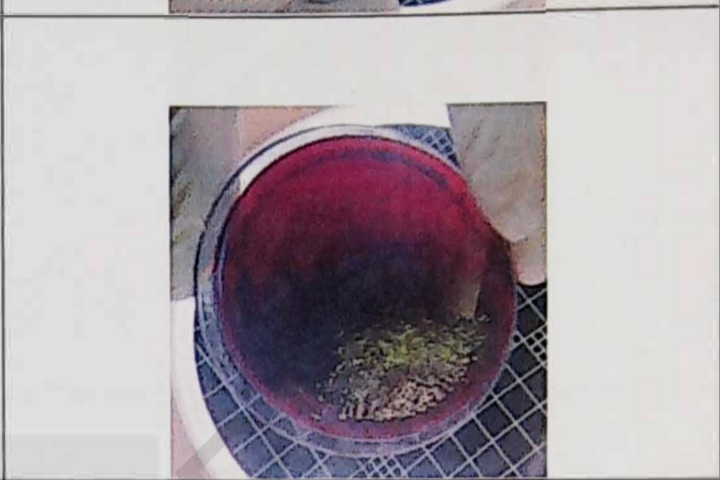

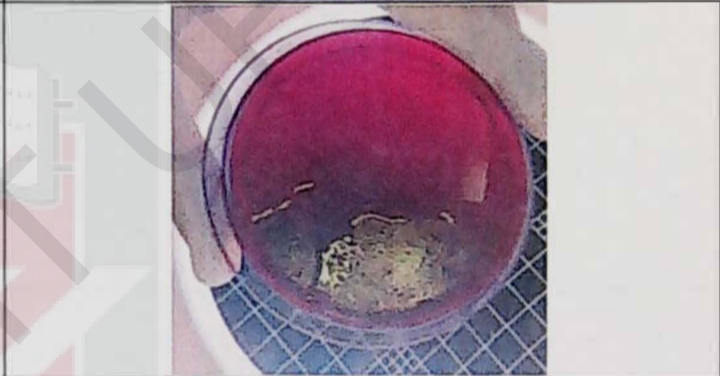
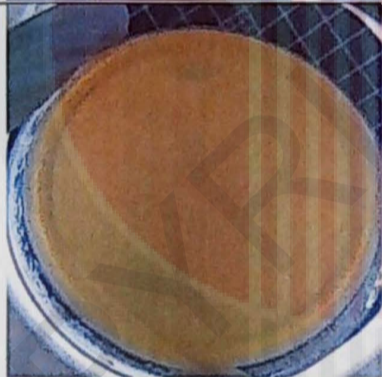


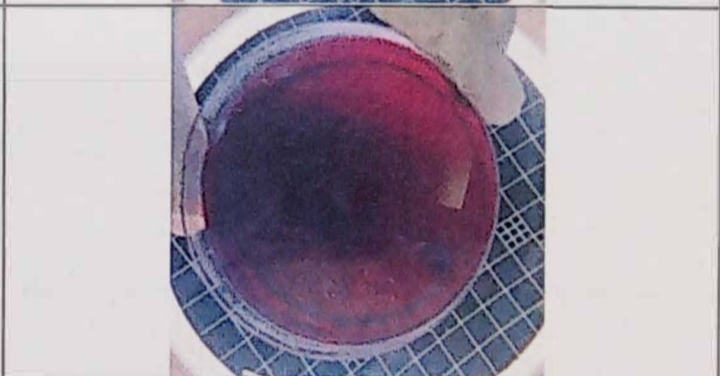

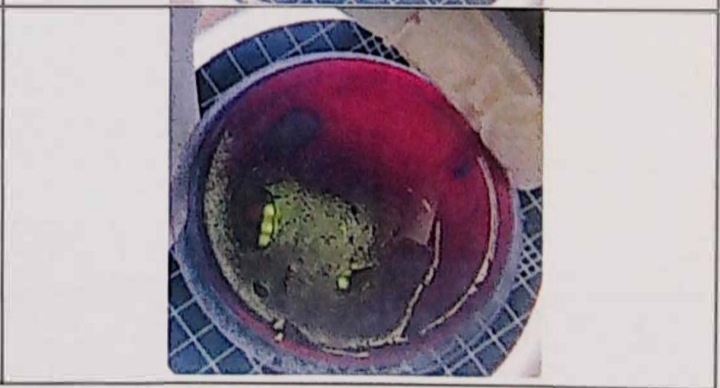
34


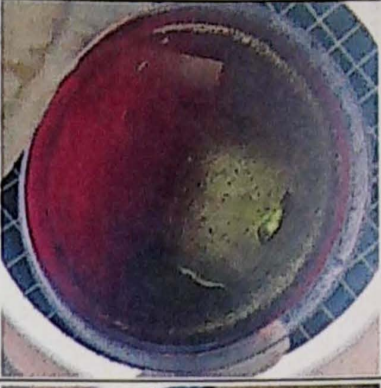
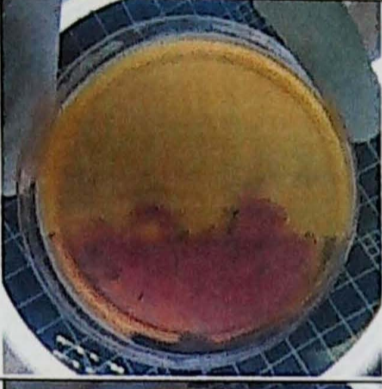
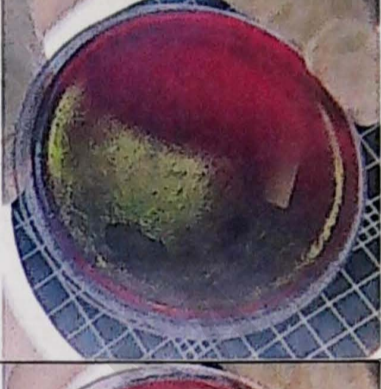
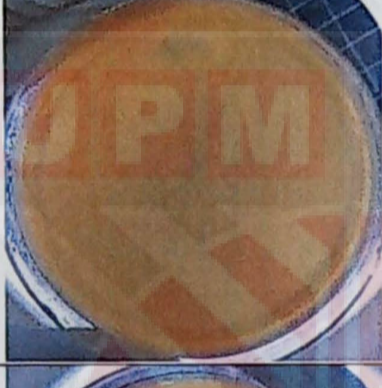

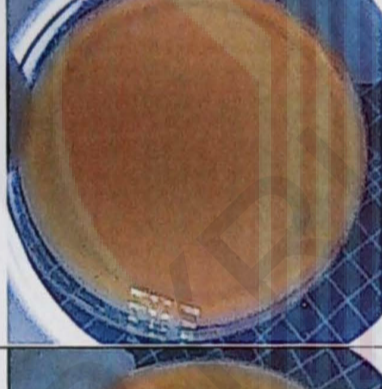
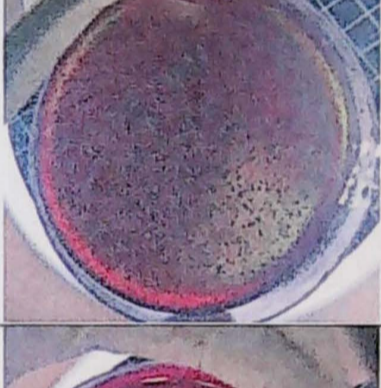
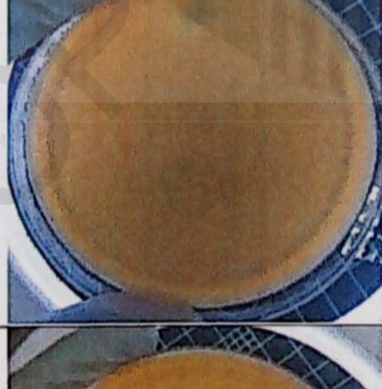
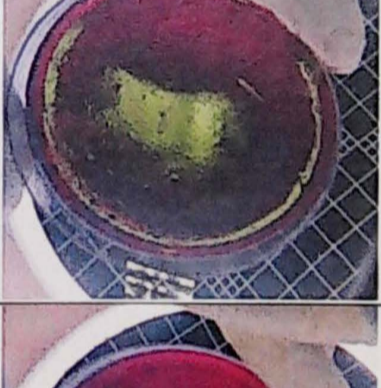
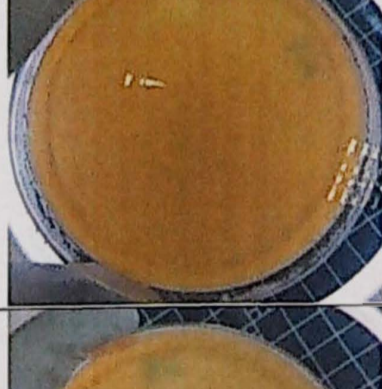
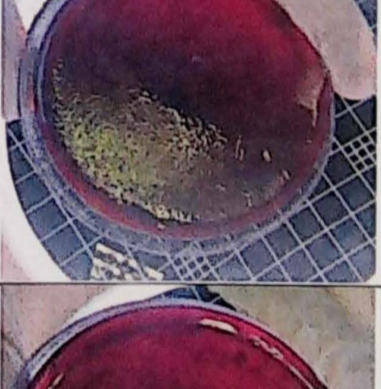
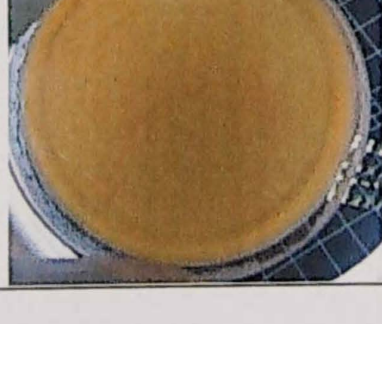



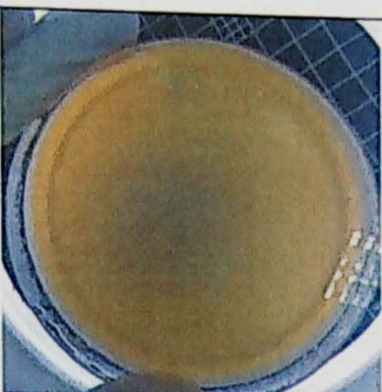


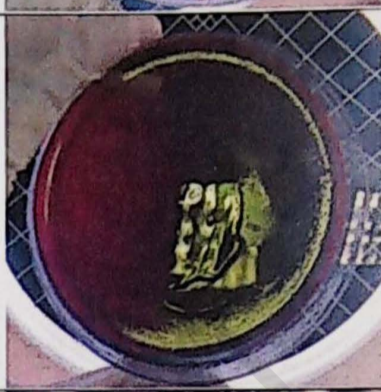
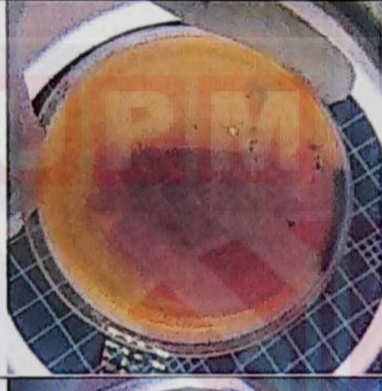
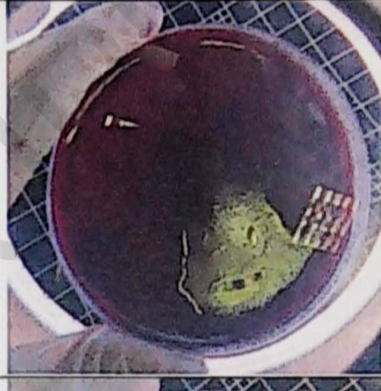


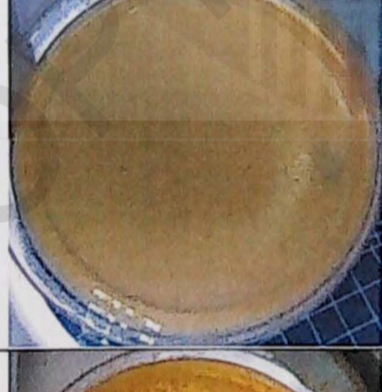




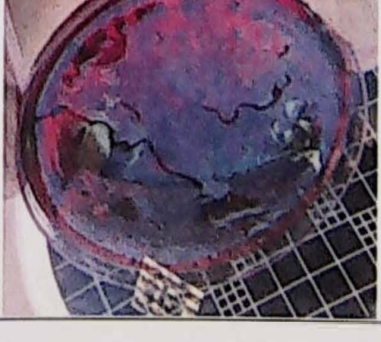
35		
36		
37		
38		
39		
40		
41		



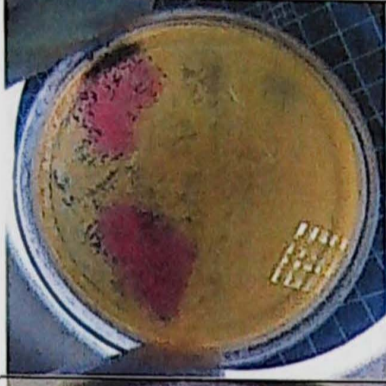

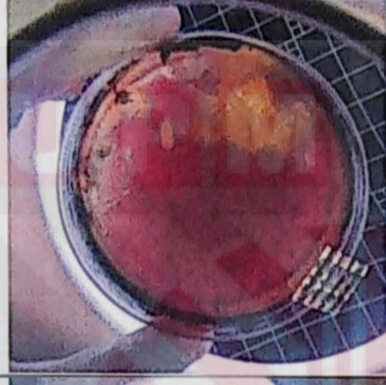
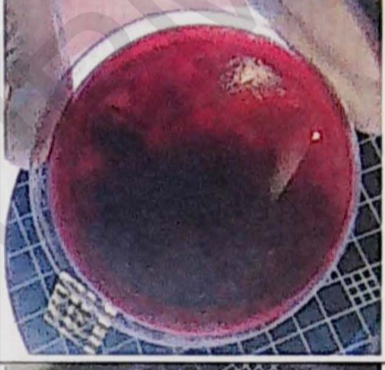
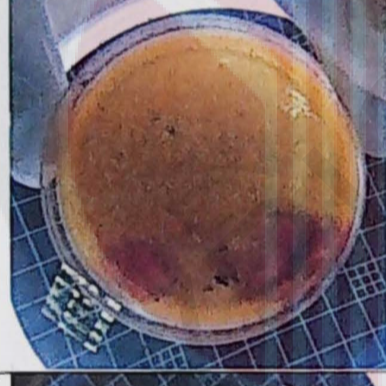

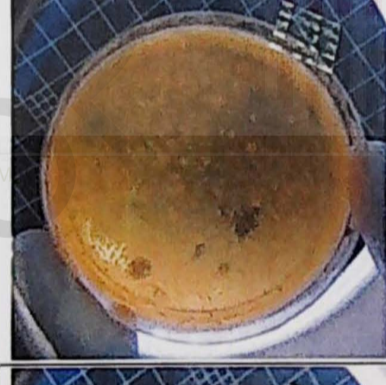
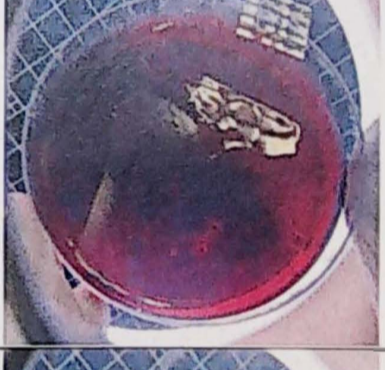
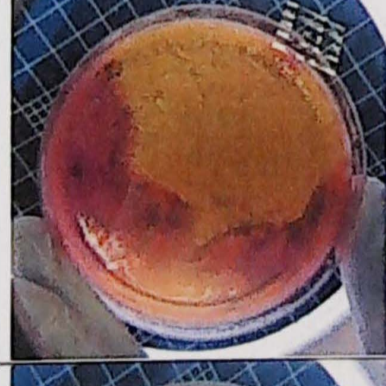

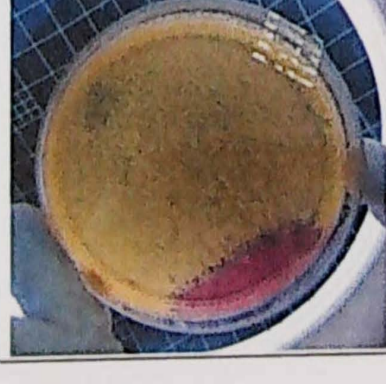
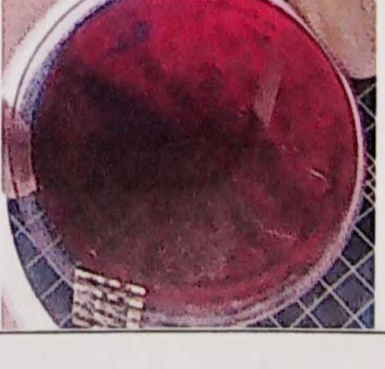
42		
43		
44		
45		
46		
47		
48		




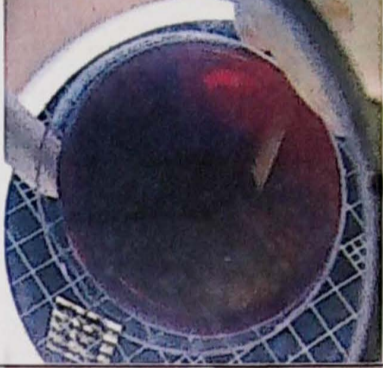
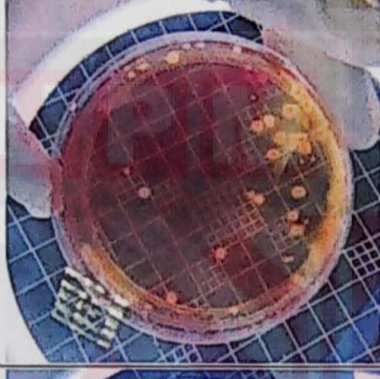
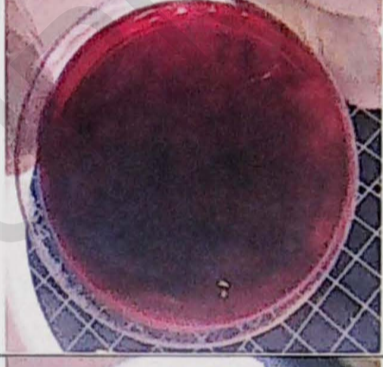
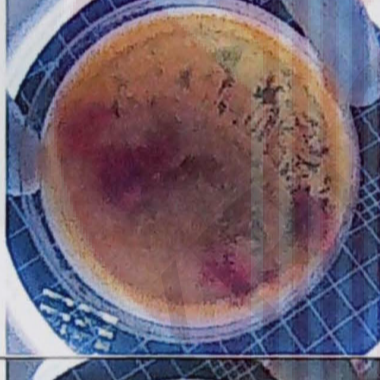





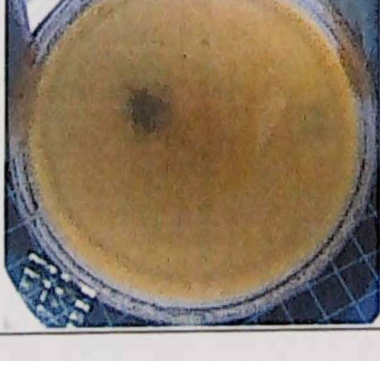
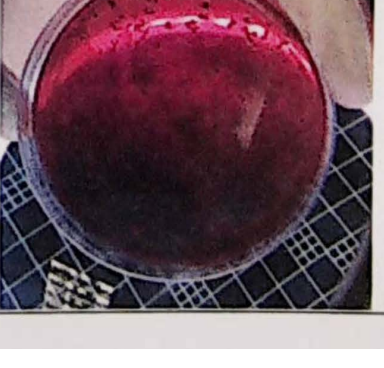
49		
50		
51		
52		
53		
54		

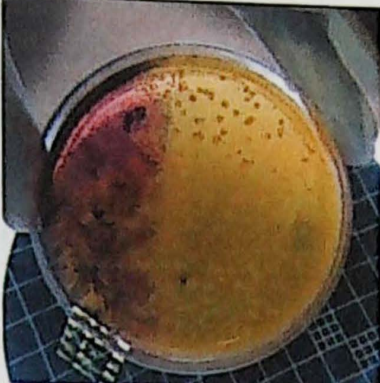
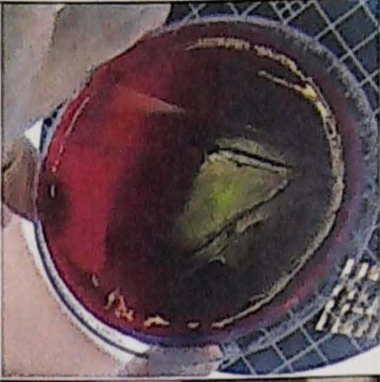
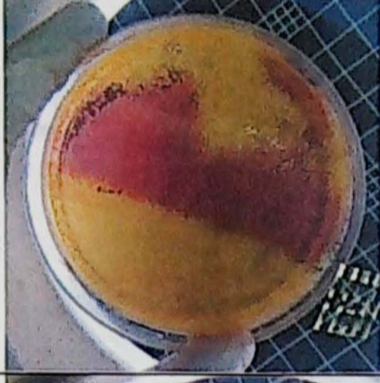
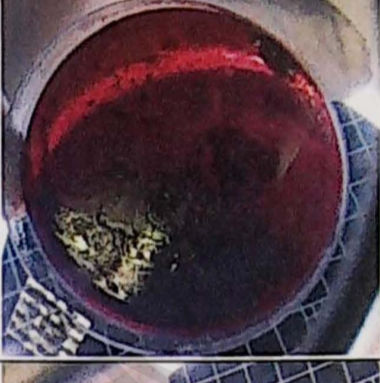
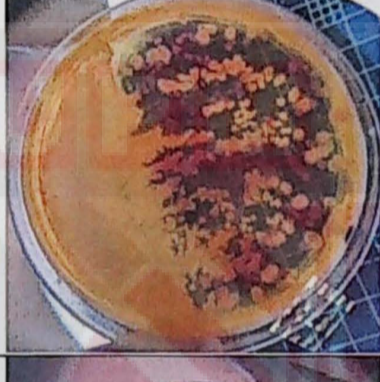



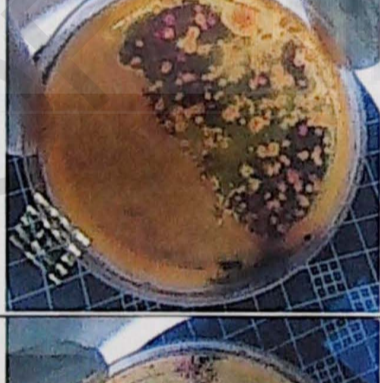





55				
56				
57				
58				
59				
60				


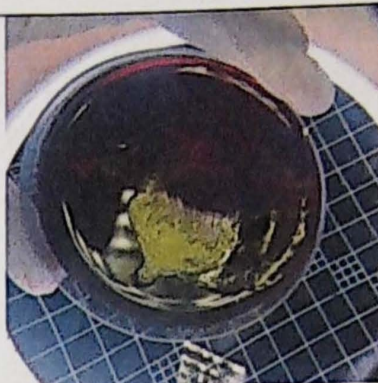


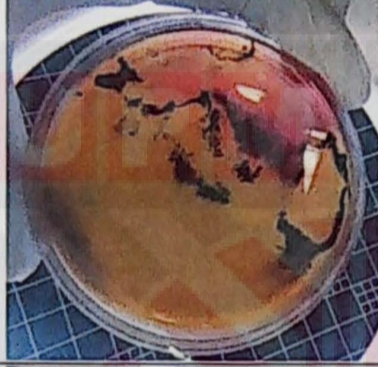

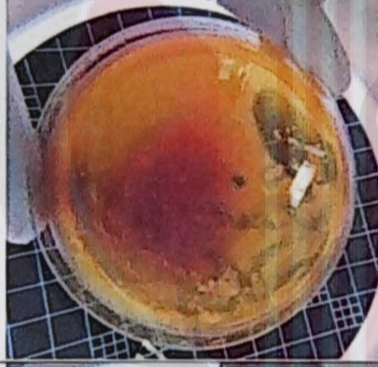
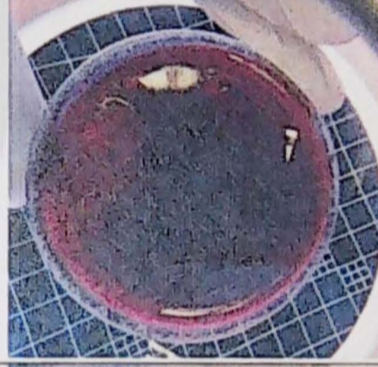


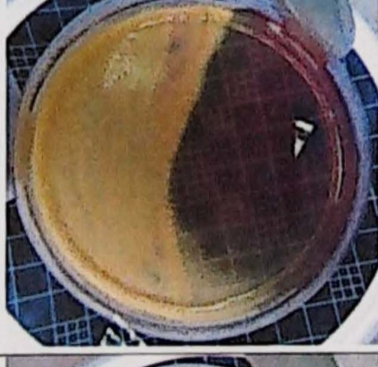
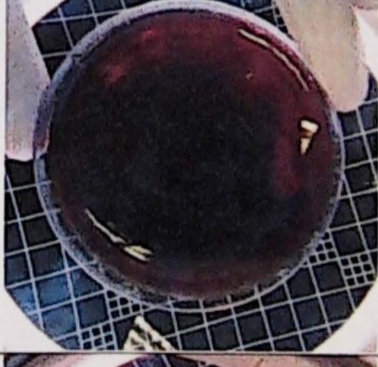
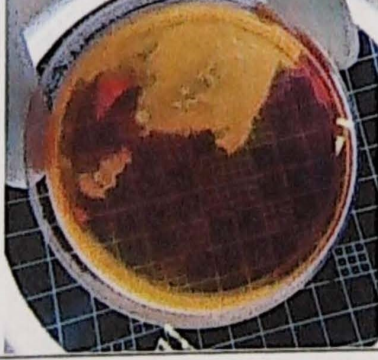

61		
62		
63		
64		
65		
66		
67		

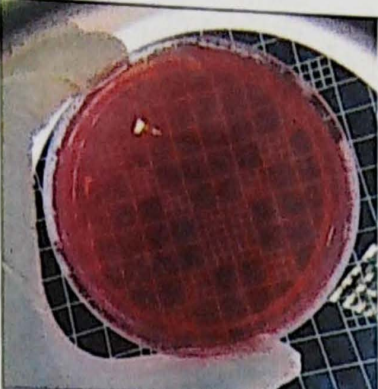

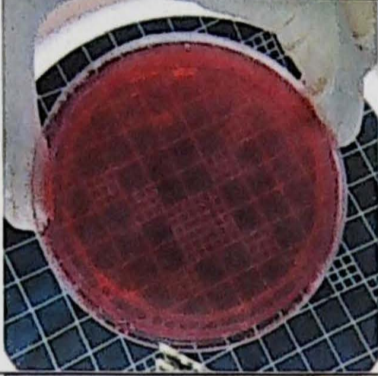

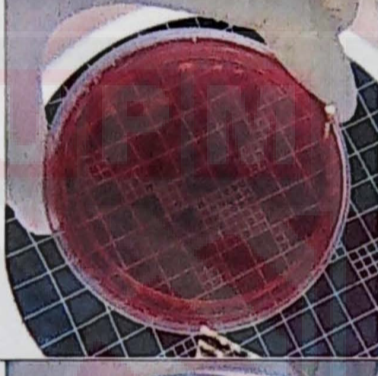
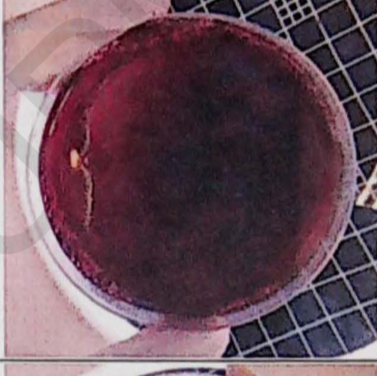
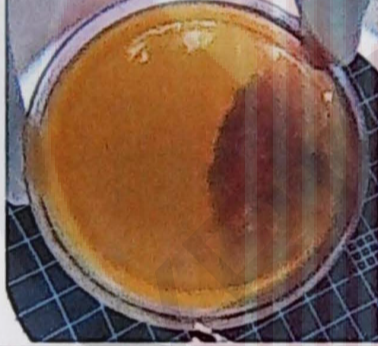
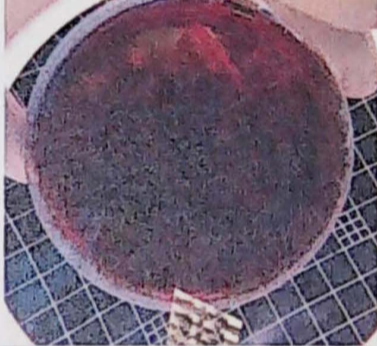

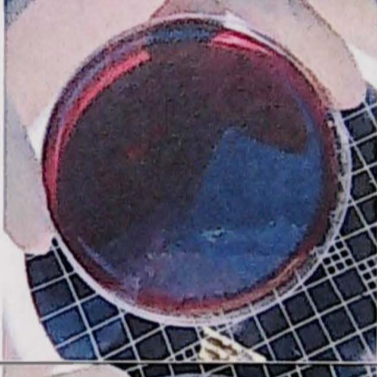
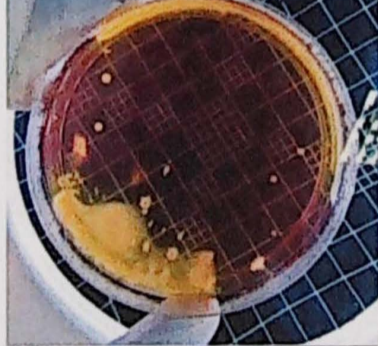
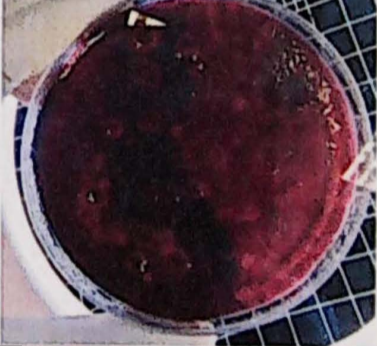
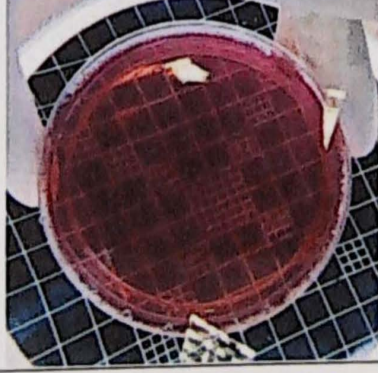
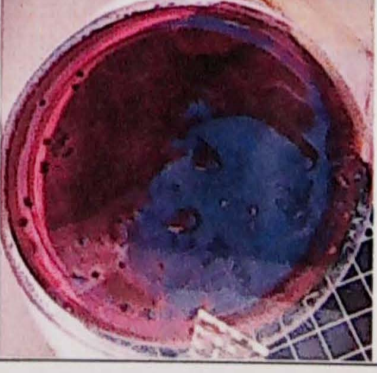
68						
69						
70						
71						
72						
73						
74						

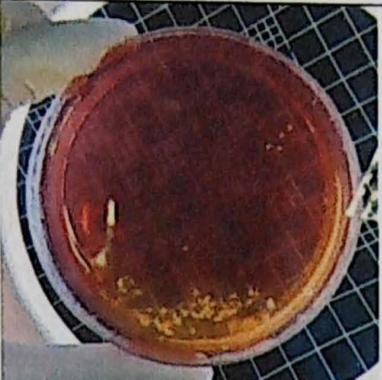
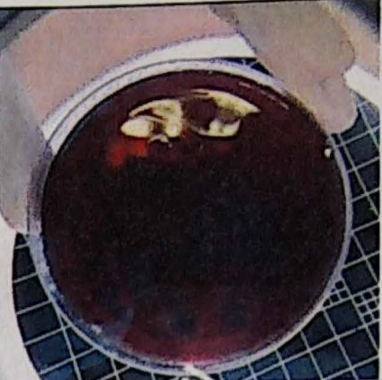
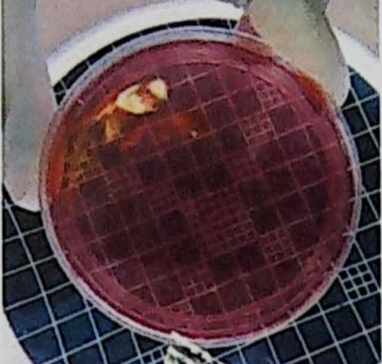

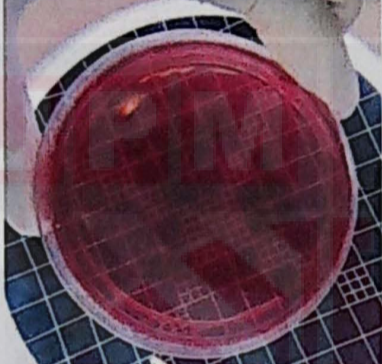

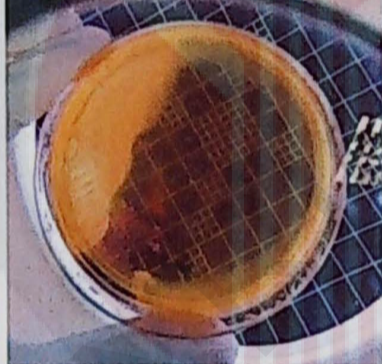

75		
76		
77		
78		
79		
80		
81		

82		
83		
84		
85		
86		
87		
88		

99		
90		
91		
92		
93		
94		
95		

96		
97		
98		
99		
100		
101		
102		

103		
104		
105		
106		
107		
108		
109		

110						
111						
112						
113						
114		