UNIVERSITI PUTRA MALAYSIA

SCREENING FOR HYGIENE PRACTICES AMONG FOOD HANDLER IN SCHOOLS IN SETAPAK, WILAYAH PERSEKUTUAN KUALA LUMPUR

VICTOR ANAK LANTAN

SCREENING FOR HYGIENE PRACTICES AMONG FOOD HANDLER IN SCHOOLS IN SETAPAK, WILAYAH PERSEKUTUAN KUALA LUMPUR

BY

VICTOR ANAK LANTAN

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

ACKNOWLEDGEMENT

First and above all, I praise God, the almighty for providing me this opportunity and granting me the capability to proceed successfully.

Apart from my efforts, the success of this project depends largely on the encouragement and guidance from others. I would like to take this opportunity to express my gratitude to the people who have been instrumental in the successful completion of this project. First and foremost, I would like to express my gratitude to both of my supervisor and co-supervisor, Dr. Sarva Mangala Praveena and Dr. Irniza Rasdi for the unlimited morale support, enthusiasm, and immense knowledge throughout the completion of this project. Their guidance helped me in all the time of research and writing of this thesis.

My sincere thanks also dedicated to Dr. Saliza Mohd Elias, the coordinator for our final year project. Her invaluable guidance and insightful comments also helped me throughout the completion of this project. Besides that, I would like to express my sincere thanks to all lectures and staff from Department of Environmental and Occupational Health who had contributed directly or indirectly throughout this project.

In addition to that, I would like to express my deepest gratitude to the school principals and the owners of the school canteens for their cooperation during the process of data collection. Finally, I would like to thank my friends and family for their continuous morale support and encouragement throughout the completion of this project.

ABSTRACT

SCREENING FOR HYGIENE PRACTICES AMONG FOOD HANDLERS IN SCHOOLS IN SETAPAK, WILAYAH PERSEKUTUAN KUALA LUMPUR

VICTOR ANAK LANTAN

Introduction: Food handlers with poor personal hygiene can be sources in spreading the foodborne disease directly, or due to cross contamination. These factors are influenced largely on the knowledge and practices of the food handlers. **Objective:** A cross-sectional study was conducted to assess the hygienic practices among food handlers in primary and secondary schools in Setapak, Wilayah Persekutuan Kuala Lumpur, considering food handler's hands hygiene knowledge and hygiene practices as well as to investigate the possible causal relationship. In addition, it is also conducted to explore the association of selected socio-demographic variables of food handlers with the knowledge and practices of food handlers on hand hygiene in selected school canteens. **Methods:** A total of nine schools with their respective school canteens were selected in Setapak area for this study. Hand hygiene knowledge and practices among food handlers were assessed using modified questionnaire and thorough observation. **Results and Discussion:** The results showed that the food handlers have an excellent knowledge and practices toward hand hygiene with mean score of 95.75 ± 6.99 and 86.96 ± 9.47, respectively. From the observations reported therein, the use of masks and changing of gloves or wash hands between handling raw and RTE were neglected by most food handlers. In the sociodemographic profile, there were significant differences ($p < 0.05$) in the following areas: personal hygiene knowledge between level of education ($p = 0.031$), hand hygiene self-reported practices and glove use between gender ($p = 0.002$ and $p = 0.006$, respectively); and glove usage practice between income status ($p = 0.004$). This study revealed a significant relationship between hand hygiene practices and self-reported hand hygiene practices of food handlers ($r = 0.403$, $p = 0.001$). **Conclusion:** Even though the results shows satisfactory level of hand hygiene knowledge and practices among food handlers, some aspects on hygiene measures such as wearing masks, changes gloves or wash hands between handling raw and RTE foods, and wearing of jewelry and watches need to be emphasized. Further continuous effort should be invested in hand hygiene education and enforcement for handlers in Setapak, Wilayah Persekutuan Kuala Lumpur.

***Keywords*: Schools, Food handlers, Hand hygiene, Practices, Knowledge**

ABSTRAK

SARINGAN AMALAN KEBERSIHAN DI KALANGAN PENGENDALI MAKANAN DI SEKOLAH DI SETAPAK, WILAYAH PERSEKUTUAN KUALA LUMPUR

VICTOR ANAK LANTAN

Pengenalan: Pengendali makanan dengan penjagaan diri yang kurang boleh menjadi sumber dalam menyebarkan penyakit bawaan makanan secara langsung, atau disebabkan oleh pencemaran silang. Faktor-faktor ini dipengaruhi sebahagian besarnya dari pengetahuan dan amalan pengendali makanan. **Objektif:** Satu kajian keratan rentas telah dijalankan untuk menilai amalan kebersihan di kalangan pengendali makanan di sekolah-sekolah rendah dan menengah di Setapak, Wilayah Persekutuan Kuala Lumpur, menitikberatkan kebersihan tangan pengendali makanan dan amalan penggunaan sarung tangan dan juga untuk mengkaji hubungan sebab dan akibat yang mungkin. **Kaedah:** Sebanyak sembilan buah sekolah di kawasan Setapak dipilih untuk menjalankan kajian ini. Pengetahuan dan amalan kebersihan tangan di kalangan pengendali makanan akan dinilai dengan menggunakan borang soal selidik yang diubahsuai serta pemerhatian pada tiap-tiap pengendali makanan. **Keputusan dan Perbincangan:** Hasil kajian menunjukkan bahawa pengendali makanan mempunyai ilmu dan amalan yang sangat baik ke arah kebersihan tangan dengan min skor iaitu 95.75 ± 6.99 bagi ilmu dan pengetahuan dalam kebersihan makanan serta 86.96 ± 9.47 bagi amalan kebersihan tangan. Daripada hasil pemerhatian yang dijalankan, penggunaan topeng dan sarung tangan serta mencuci tangan antara pengendalian makanan mentah dan makanan sedia dimakan adalah paling diabaikan oleh pengendali makanan. Di samping itu, terdapat perbezaan yang signifikan ($p<0.05$) pada sosio-demografi serta pembolehubah-pembolehubah yang berikut iaitu pengetahuan kebersihan diri antara tahap pendidikan ($p= 0.031$), laporan kendiri amalan kebersihan tangan dan penggunaan sarung tangan antara jantina ($p = 0.002$ dan $p = 0.006$) serta amalan penggunaan sarung tangan antara status pendapatan ($p = 0.004$). Selain itu, kajian ini mendedahkan hubungan yang signifikan antara amalan kebersihan tangan dan laporan kendiri amalan kebersihan tangan ($r = 0.403$, $p = 0.001$). **Kesimpulan:** Walaupun keputusan menunjukkan tahap yang memuaskan di antara pengetahuan dan amalan kebersihan tangan di kalangan pengendali makanan, beberapa aspek mengenai langkah-langkah kebersihan seperti penggunaan topeng, pertukaran penggunaan sarung tangan serta membasuh tangan sewaktu pengendalian makanan mentah dan yang sedia dimakan, dan pemakaian barang perhiasan serta jam tangan perlu dititikberatkan. Usaha berterusan yang lebih lanjut perlu dititikberatkan dalam aspek pendidikan kebersihan tangan serta penguatkuasaan kepada para pengendali makanan di Setapak, Wilayah Persekutuan Kuala Lumpur.

***Kata kunci*: Sekolah, Pengendali makanan, kebersihan Tangan, Amalan, Pengetahuan**

CONTENTS

	Page
DECLARATION	**ii**
SIGNATURE OF SUPERVISOR/INTERNAL EXAMINER	**iii**
ACKNOWLEDGEMENT	**iv**
ABSTRACT	**v**
ABSTRAK	**vi**
CONTENTS	**vii - xi**
LIST OF TABLES	**xii**
LIST OF FIGURES	**xiii**
LIST OF APPENDICES	**xiv**
LIST OF ACRONYMS AND ABBREVIATIONS	**xv**
CHAPTER 1: INTRODUCTION	
1.1 Introduction	1 - 5
1.2 Problem Statements	5 - 7
1.3 Study Justification	7 - 8

1.4 Variables of study 8

1.5 Definition of variables 8 - 10

1.6 Research objectives

1.6.1 General objective 11

1.6.2 Specific objectives 11 - 12

1.7 Hypothesis 12

1.8 Conceptual Framework 13 - 14

CHAPTER 2: LITERATURE REVIEW

2.1 Nutrition 15 - 16

2.2 Food Safety 16 - 17

2.3 Food Hygiene 18

2.4 Hygiene Practices 19

2.5 Food Handlers 20 - 21

2.6 Personal Hygiene 21

2.7 Summary of studies done related to knowledge, attitude, and practices of food handlers on hand hygiene 22- 27

CHAPTER 3: METHODOLOGY

3.1 Study Design 28

3.2 Study Location 29

3.3 Study Population 30

3.4 Sampling

3.4.1 Study Sample 30

3.4.2 Sample Size 30 - 31

3.4.3 Sampling Method 32

3.4.4 Sampling Unit 32

3.5 Study Instrumentation

3.5.1 Questionnaire 32 - 33

3.5.2 Hygiene practice checklist 34

3.6 Data Collection

3.6.1 Questionnaire distribution 34 - 35

3.6.2 Hygiene practice checklist 35

3.7 Quality Control

3.7.1 Pre-test questionnaire 35 - 36

3.8 Statistical Analysis 36

3.9 Ethical Issues 37

3.10 Study Limitation 37 - 38

CHAPTER 4: RESULTS

4.1 Sociodemographic profile of school canteen food handlers 40 - 42

4.2 Knowledge on hand hygiene among school canteen food handlers 42 - 44

4.3 Self-reported hand hygiene practices 45 - 47

4.4 Observation on hand hygiene practices 48 - 50

4.5 The influences of food handlers' sociodemographic profiles on hand hygiene 50 - 51

4.6 Pearson correlation among food handler's hand hygiene knowledge and self-reported practices 51 - 53

CHAPTER 5: DISCUSSION, CONCLUSION, AND RECOMMENDATION

5.1 Discussion

5.1.1 Sociodemographic profiles of food handlers 54 - 55

5.1.2 Knowledge on hand hygiene among food handlers 55 - 57

5.1.3 Self-reported hand hygiene practices 57 - 60

5.1.4 Observation on hand hygiene practices 60 - 62

5.1.5 The influences of food handlers' sociodemographic profiles on hand hygiene 62 - 63

5.1.6 Pearson correlation among food handler's hand hygiene knowledge and self-reported practices 64 - 65

5.2 Conclusion 65

5.3 Recommendation 66 - 67

References 68 - 73

LIST OF TABLES

Table	Caption	Page
Table 2.1	Summary of studies done related to knowledge, attitude, and practices of food handlers on hand hygiene	23 - 27
Table 4.1	Sociodemographic profiles of food handlers	41
Table 4.2	Food handlers' knowledge towards hand hygiene	43 - 44
Table 4.3	Food handlers' self-reported hand hygiene practices	46 - 47
Table 4.4	Observed hand hygiene practices among food handlers	49 - 50
Table 4.5	Influences of food handlers' sociodemographic profiles on hand hygiene	51
Table 4.6	Correlation coefficient among food handlers' hand hygiene knowledge and self-reported practices	53

LIST OF FIGURES

Figure	Caption	Page
Figure 1.1	Significant growths of incident rates for food poisoning cases in 12 consecutive years.	3
Figure 1.2	Conceptual framework of study	14

LIST OF APPENDICES

Appendix	Caption
Appendix A	Gantt Chart
Appendix B	Questionnaire of study
Appendix C	Hygiene practice checklist
Appendix D	Information Sheet of respondent
Appendix E	Consent form for respondent

LIST OF ACRONYMS AND ABBREVIATIONS

KAP	Knowledge, Attitude, and Practice
MOH	Ministry of Health
NOB	Not observed
RTE	Ready-to-eat
SD	Standard deviation
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 **Background**

Foodborne illnesses have caused a major morbidity and mortality around the world. Based on a trend analysis on the occurrence of foodborne illness in selected food service established in the United States demonstrated that from year 1998 to 2008, the non-compliance percentage remained high for three risks factors such as poor personal hygiene, improper handling of food, and contaminated food surfaces or equipment (FDA, 2010). It is reported that poor personal hygiene has been identified as one of the main risk factors in foodborne diseases (FDA, 2009; FDA, 2000). Poor personal hygiene was also reported to its contribution in 42% of food-borne outbreaks in the United States in the period of 1975 to 1998 (Aycicek *et al.*, 2004).

With Malaysia's population of 28.34 million in 2010, expectations and demand by health community is on the rise (Ministry of Health, 2012). In 2012, food poisoning was the most critical factor in food and water-borne diseases which contributed to more than 56 incident rates per 100,000 populations of Malaysia. Other reported communicable diseases incident rates in year 2012 were cholera (2.02), hepatitis A (1.71), typhoid (0.84), and dysentery (0.15). On closer examination, Figure 1.1 demonstrates the significant growth of incident rates for food poisoning cases in 12 consecutive years has been increasing to 25 times in worldwide (Ministry of Health, 2012) which alarmed for further action.

The incidence of food poisoning in Malaysia has gradually increased over the years and about 65.9% of food poisoning cases occur in primary and secondary schools (MOH, 2003). A bacterial survey conducted as a collaborative project between Malaysia and Japan from May (2002) to April (2003), a total of 84 out of 1447 school hostels throughout Malaysia showed high levels of microbiological contamination in Ready-to-Eat (RTE) food samples, drinks, cooking utensils, cutlery and the environment (Hodate, Y. 2004). The significant sources of this contamination may include sources from workers hands, cooking utensils and present of pests in the cooking area such as rodents and cockroaches.

Diarrhea is one of the most important and unacceptable public health problems that we were confronted with where children up to 5 years of age were

those who most affected. In regards to this matter, food plays a major role in the epidemiology of this illness and other food related illnesses (Motarjemi et al., 1993). There are approximately 1.5 billion episodes of diarrhea every year in developing countries and this figure has remained more or less constant over the last 20 years, while mortality during the same period has been reduced significantly. Twenty years ago the WHO estimated that about 5 million children died annually from diarrhea. Today the figure is closer to 2 million (WHO 99.1, unpublished), which is a 'success' from a public health point of view, and is connected with the aggressive promotion of rehydration and better case management.

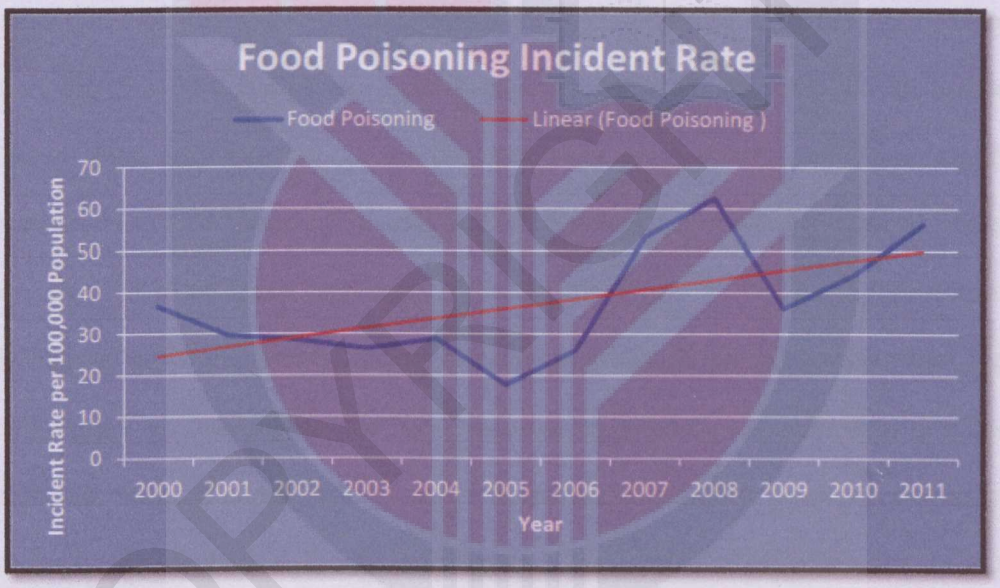

Figure 1.1: Significant growth of incident rates for food poisoning cases in 12 consecutive years. (Source: *World Health Organization, 2011*)

Food is essential for us to sustain life and in order to sustain our life and the food itself must be essentially safe from any unwanted hazards. However, the quality or free-hazards management is one of the most challenging tasks that food services

encounter (Payne-Palacio & Theis, 2012). The challenges, according to Payne-Palacio and Theis (2012) include: (1) people ignore the reported outbreaks because it is only a fraction of the total of people who actually get sick from food; (2) under-reported statistics due to complications in deciding food-borne illness as symptoms varies on different victims depending on their age, state of being pregnant, or those with compromised immune systems; and (3) agents of food-borne illness varies e.g. water, contact with animals, or person to-person.

Foodborne illnesses are widely reported due to microbial contamination loads contain in food and water (Cunningham et. al, 2011; Lahou et. al, 2012). Specifically, there are three key factors that contribute to the outbreaks of microbial foodborne illness. First and foremost is the contamination of foodborne pathogens which present in the food. Once it is present in food, the chance of acquire foodborne illness are high. In some cases, incidence of foodborne illness related to the growth of foodborne pathogen which already present in food. Those pathogens have the opportunity to multiply in the food in order to produce an infectious dose or sufficient toxin to cause illness. Apart from that, survivality factor of foodborne pathogen contribute to outbreaks of microbial foodborne illness. When present at a dangerous level, they must be able to survive in the food during its storage and processing.

In the study of personal hygiene intervention measures, it is highlighted that infected food handlers could also transmit infectious intestinal diseases (IID) caused

by food-borne pathogens (Michaels et al., 2004). Food handlers with poor personal hygiene can be sources in spreading the food-borne disease directly, or due to cross contamination. These factors are influenced largely on the knowledge and practices of the food handlers (Mead et. al., 1999). Thus, hygienic practices among food handlers are crucial as they have direct contact to activities, such as deboning, slicing, chopping, adding garnishes, most of which does not require further heating steps prior to consumption.

Hence, the purpose of this study is intended to assess the hygienic practices among food handlers in primary and secondary schools in Setapak, Wilayah Persekutuan Kuala Lumpur, considering food handler's hands hygiene and glove usage practices as well as to investigate the possible causal relationship. In addition, it is also conducted to explore the association of selected socio-demographic variables of food handlers with the knowledge and practices of food handlers on hand hygiene in selected school canteens in Setapak, Wilayah Persekutuan Kuala Lumpur.

1.2 **Problem Statements**

Nowadays, food-borne illnesses among school children have been widely increased due to the microbiological contaminations in their food. In children up to 5 years old, diarrhea is one of the most important and unacceptable public health

problems that we are confronted with and food plays a major role in the epidemiology of this and other diseases (Motarjemi et al. 1993). These outbreaks were often caused by poor personal hygiene among the food handlers.

Food handlers with poor personal hygiene could be the primary sources in channeling the food-borne contaminants and diseases either directly or indirectly to the consumer. At some point, the spreading of food-borne diseases can be due to cross-contamination. Previous study by Campos et al. (2009) listed several incorrect practices among food handler that may led to cross-contamination such as not wearing hair protection and long nails or wore nail polish, wore jewellery and skin infection.

Addressing the knowledge and practices of personal hygiene are vital in all of our daily activities. At the same time, it is also important to the public health. Primary purpose in addressing the knowledge and practices of personal hygiene is to prevent any faecally-oral transmitted diseases. The finger may get contaminated with one's own faeces, which either directly or indirectly and can be an important vehicle for transmitting microorganism to food.

Several studies reported that lack of knowledge may result to the poor hygiene practices among the food handlers (Cakiroglu and Ucar, (2008)) and food safety practices (Clayton et al (2002)). At the same time, previous observational

study highlighted that those with higher knowledge were not always put into practices among the food handlers (Manning and Snider, 1993).

1.3 Study Justification

This study was conducted to assess the hygienic practices among food handlers in primary and secondary schools in Setapak, Wilayah Persekutuan Kuala Lumpur, considering food handler's hands hygiene and glove usage practices as well as to investigate the possible causal relationship. At the same, it is conducted to explore the association of selected socio-demographic variables of food handlers with the knowledge and practices of food handlers on hand hygiene in selected school canteens in Setapak, Wilayah Persekutuan Kuala Lumpur.

The scope of hygienic practices in this study will focus on knowledge of hand hygiene and the self-reported hygiene practices among food handlers. The knowledge on hand hygiene comprises of the importance of personal hygiene knowledge and cross-contamination knowledge in minimizing the risk of food contamination. Meanwhile, the self-reported practice section addressed the importance of hand-washing and glove usage practices among food handlers in preventing the occurrence of food-borne diseases.

The outcome of study shall benefits the community such as School Principal, Parents, and others governmental bodies as references in level of personal hygiene among food handlers in selected school canteens which focus on the level of knowledge and practices in hand hygiene. Apart from that, this study will be conducted to enhance better understanding and awareness of food safety and personal hygienic practices. Based on the findings obtained in this study, perhaps there will be better interventions in improving the hand hygiene practice thus minimizing the risk of food borne illnesses. Finally, the finding might be useful to generate a baseline data for future research.

1.4 **Variables of study**

1.4.1 **Independent variables**

1.4.1.1 Hygiene Practices

1.4.1.2 Food Handlers

1.4.2 **Dependent variables**

1.4.2.1 Level of knowledge and self-reported hygiene practices

1.5 **Definition of variables**

1.5.1 **Conceptual Definition**

1.5.1.1 Hygiene Practices

The terms hygiene defined as "a system of principles for preserving health" while practices is defined as "the actual doing of something," "to do or engage frequently," or "to make the habit of "(Merriam-Webster, 2006).

1.5.1.2 Food Handlers

The terms food handlers defined as individuals who are (1) directly involved in the food preparation, (2) come into contact with food or food contact surfaces, and (3) handle packaged or unpackaged food, or appliances, in any food premises (Food Act 1983 [Act 281], 2012).

1.5.2 **Operational Definition**

1.5.2.1 Hygiene Practices

The use of the International Organization for Standardization (ISO) method 9001, Hazard Analysis Critical Control Point (HACCP), and Total Quality Management (TQM) are among the prevention taken by many food operations in application of good manufacturing practices and good hygiene practices (Aruoma, 2006). The hygiene practices performance of food handlers were assessed by using modified checklist from previous study by Tan et al., 2013).

1.5.2.2 Food Handlers

Food handlers who works in school canteens will be assessed based on their socio-demographic profile, health status related to previous working experience, level of food hygiene practices and knowledge, and level of their personal hygienic practices which focus more on their hand washing practices and suitability of gloves used during food preparation.

1.6 **Research Objectives**

1.6.1 General Objective

The general objective of this study is to assess the hygienic practices among food handlers in primary and secondary schools in Setapak, Wilayah Persekutuan Kuala Lumpur, considering food handler's hands hygiene and glove usage practices as well as to investigate the possible causal relationship.

1.6.2 Specific Objectives

The specific objectives of this study are as follows:

i. To determine the sociodemographic information among the food handlers in selected school canteens in Setapak, Wilayah Persekutuan Kuala Lumpur.

ii. To determine the level of hygiene knowledge on hand hygiene among food handlers in selected food canteens in Setapak, Wilayah Persekutuan Kuala Lumpur.

iii. To determine the level of practices on hand hygiene which focusing on hand washing practice and glove usage practice among food handlers in selected food canteens in Setapak, Wilayah Persekutuan Kuala Lumpur.

iv. To assess the hygiene practices performance among food handlers in selected food canteens in Setapak, Wilayah Persekutuan Kuala Lumpur.

v. To explore the association of selected socio-demographic variables of food handlers with the knowledge and practices of food handlers on hand hygiene in selected school canteens in Setapak, Wilayah Persekutuan Kuala Lumpur.

1.7 **Hypothesis**

Based on the specific objectives, there were several hypotheses that can be generated as follows:

i. The level of knowledge and practices on hand hygiene can be influenced by the sociodemographic profiles of food handlers.

ii. The level of hygienic knowledge and practices on hand hygiene can be different from each of selected school canteens.

iii. The components of hand hygiene knowledge associated with the components of hand hygiene practices among food handlers.

1.8 **Conceptual Framework**

Screening for hygiene practices was conducted among food handler in each school canteen to assess their level of hand hygiene knowledge and self-reported practices. At the same time, thorough observation also was conducted to assess their hygienic practices before and during preparation of RTE foods, handling of raw foods and overall hygiene performance of the food handler.

The food handlers that participated in this study were assessed based on their level of knowledge on hand hygiene, self-reported hand hygiene practices, and hygiene practice performances. In determining the level of knowledge on hand hygiene among food handler, there were two hand hygiene aspects were assessed; (1) knowledge on personal hygiene and (2) knowledge on cross-contamination. Meanwhile, the self-reported hand hygiene practices among food handlers were assessed based on the hand washing practices and glove usage practices.

The level of knowledge on hand hygiene among food handlers can be differs from each other with regards to their age groups, gender, level of education, and working experience. Previous study reported that food handlers' knowledge of hand hygiene influenced by their level of education (Tan et al. (2013), Jianu and Chris (2012) and Toh and Birchenough (2000)). Diagram 1.1 showed the conceptual framework of the study.

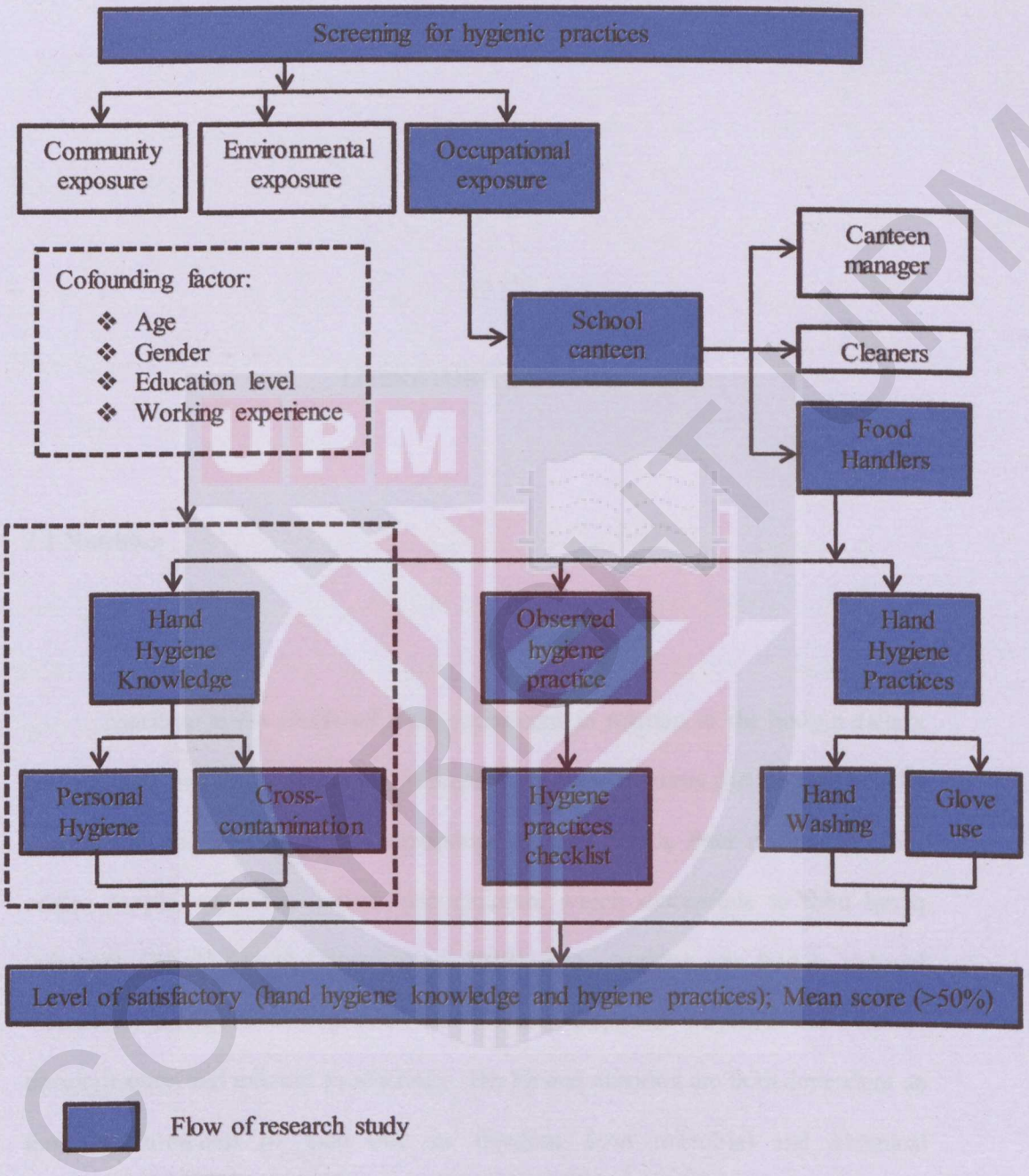

Diagram 1.1: Conceptual framework of study

CHAPTER 2

LITERATURE REVIEW

2.1 **Nutrition**

Nutrition is the intake of food, considered in relation to the body's dietary needs. Good nutrition composed of an adequate, well balances diet combined with regular physical activity. It is a cornerstone of good health. Poor nutritional status render people, especially infants and children, which susceptible to food borne infections (World Health Organization, 2012). Poor nutrition can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental developmental and reduced productivity. Health and nutrition are both dependent on the wholesomeness of food and its freedom from microbial and chemical contamination, as well as on its adequacy with respect to quantity and nutritive value.

Nutrition is more focused on the steps of biochemical sequences through which substances inside us and other living organisms are transformed from one form to another which through metabolism pathways and metabolic pathways. In addition, nutrition involves in identifying how certain diseases, conditions or problems may be caused by dietary factors, such as poor diet (malnutrition), food allergies, metabolic diseases, and others.

2.2 **Food safety**

Food safety is a scientific discipline describing handling, preparation, and storage of food in ways that prevent foodborne illness. This includes a number of routines that should be followed to avoid potentially severe health hazards which may impair our health. Food safety is major public health priority nowadays. Each year, unsafe food is responsible for illness in at least 2 billion people worldwide and eventually resulting to death (World Health Organization, 2004). These serious outbreaks of foodborne diseases have been documented on every continent in the past decade as well as in many countries and the rates are increasing significantly. According to World Health Organization (2009), there are several concerned key of global food safety. There are such as; spread of microbiological hazards such as bacteria including *Salmonella spp.* and *Escherichia coli*, Chemical food contaminants, assessments of new food technologies such as genetically modified food, and strong food safety systems in most countries to ensure a safe global food chain.

Microbiological hazard is known for its potential in causing food-borne illness. Further, recent health risk assessments have revealed that the food-borne disease may be triggered by: (1) improper food handling training, (2) the use of untreated water for non-drinking purposes, and (3) low sanitation and hygiene status (Ministry of Health, 2012). Illnesses caused by food-borne microorganisms can present as serious public health problems. Verotoxigenic E.coli, Salmonellae, and Staphylococcus aureus are examples of food-borne pathogen capable of causing disease (Steele et. al, 1997; US Food & Drug Administration 2003).

Food safety programs have become increasingly necessary due to technological advances in food and agricultural sectors and also due to social changes introducing new food habits. In the past, food was consumed by those who produced it or by their immediate neighbors. Increased world production, urbanization, industrialization and migration have however introduced new food safety problems into our food supply (Anand, C. *et al*, 1999).

2.3 Food hygiene

The terms hygiene defined as "a system of principles for preserving health" while practices is defined as "the actual doing of something," "to do or engage frequently," or "to make the habit of "(Merriam-Webster, 2006). Food hygiene may be defined as "the set of basic principles employed by the food operators at all stages of food handling to ensure that food is safe to consume and is good keeping quality. The different stages of food handling include in production, packaging, storage, delivery, preparation, and presentation.

There are different task involved in food hygiene. There are such as; food poisoning prevention, food spoilage prevention, cleaning and sanitation, personal hygiene, pest control, proper food preparation procedures, proper food storage procedures, proper food handling, purchasing food from a reliable sources, and stock solution.

In relation to reduce the burden of food-borne illnesses worldwide, food hygiene is so important to prevent food poisoning, reduce food spoilage, avoid prosecution, avoid loss of business, ensure safe working conditions, and fulfilling the requirements of Food Act 1983 and Food Hygiene Regulations 2009.

2.4 Hygiene practices

The terms hygiene defined as "a system of principles for preserving health" while practices is defined as "the actual doing of something," "to do or engage frequently," or "to make the habit of "(Merriam-Webster, 2006). Hence, hygiene practice in this study is described as a habit to engage in health prevention activities. Seriousness in hygiene practices is vital because one food-borne illness outbreak can have devastating consequence for health (Serraino et al., 2010).

For every preventive measure taken to curb foodborne illness, it is important to understand the correct food hygiene practices (Luyt, 1996). The use of the International Organization for Standardization (ISO) method 9001, Hazard Analysis Critical Control Point (HACCP), and Total Quality Management (TQM) are among the prevention taken by many food operations in application of good manufacturing practices and good hygiene practices (Aruoma, 2006). The prevention measures in Malaysia are voluntary based and adoption of hygiene practices is facilitated under Food Act 1983 [Act 281] and Food Hygiene Regulations 2009.

2.5 **Food handlers**

In this study, food handlers are the key players in determining and controlling the best practices of hygiene. The terms food handlers defined as individuals who are (1) directly involved in the food preparation, (2) come into contact with food or food contact surfaces, and (3) handle packaged or unpackaged food, or appliances, in any food premises (Food Act 1983 [Act 281], 2012).

Specifically, personal hygiene covers the aspect of hand hygiene, personal health and attitudes as well as personal clean attire. Food handles with poor personal hygiene can be sources in spreading the food-borne diseases either directly contact with food surfaces or due to cross-contamination of food items. These factors are largely influenced on the knowledge and practices of the food handlers (Mead *et al.*, 1999). Therefore, appropriate personal cleanliness and practices must be practiced by all food handlers in order to reduce the risk of microbial spread in foods.

While food borne pathogens is the cause of about 30% of human diseases (Serraino et al., 2010), Nyi et al. (2007) highlighted that food handlers implicated about 10 to 20% of the disease outbreaks. In the study of personal hygiene intervention measures, it is highlighted that infected food handlers could transmit infectious intestinal diseases (IID) caused by food-borne pathogens (Michaels et al., 2004). Thus, food handlers are crucial as they have direct contact to activities, such

as deboning, slicing, chopping, adding garnishes, most of which does not require further heating steps prior to consumption.

Food handlers in school have the responsibility of ensuring the production of safe foods, and their knowledge, attitudes and practices play a major role in the occurrence of food poisoning cases (Angelillo et al., 2005).

2.6 **Personal Hygiene**

The term hygiene is used to define as an application of sanitary principles for the preservation of health. It is comprises of different set of practices which being performed by all individuals in order to maintain their own health. Maintaining a good hygiene practices considered as a best practices and it is a must for each one of us to protect ourselves from getting infected of different kind of illnesses. In this scope, hygiene itself is applied in culinary business. Hygiene in culinary business is important in every aspect related to the food management and cooking in order to prevent any sort of food contamination, preventing foodborne illnesses, and minimize the transmission of disease to foods, humans as well as animals. Hence, it is vital because one food-borne illness outbreak can have devastating consequence for health (Serraino et al., 2010).

2.7 Summary of studies done related to knowledge, attitudes and practices (KAP) of food handlers on hand hygiene

There are several studies have been conducted locally and internationally which concerns to the knowledge, attitudes and practices (KAP) among food handlers with regard to the hand hygiene, food hygiene and sanitation, as well as their personal hygiene. Extensive qualitative approaches and thorough observation through checklist and in-depth interview been conducted to evaluate and assess each food handlers with regard to their level of knowledge, attitudes and practices (KAP). Most of these approaches were taken since it relies on the opinion of individuals and how individuals perceived through their act (Creswell, 2005).

Most of these studies highlighted that proper hand hygiene training and personal hygiene campaign should be thoroughly monitored from time to time. Table 2.1 depicts the summary of studies done both locally and internationally related to knowledge, attitudes and practices (KAP) of food handlers on hand hygiene practices. Aspects of bacteriological contamination was also included in order to determine any significant information which relate to the knowledge, attitudes, and practices (KAP) on hygiene practices with occurrence of bacteriological contamination.

Table 2.1: Summary of studies related to knowledge, attitudes and practices (KAP) of food handlers on hand hygiene practices.n

Scope	Author	Title	Summary
Knowledge, attitude and practices (KAP)	Abdul-Mutalib et al., 2012	Knowledge, attitude and practices regarding food hygiene and sanitation of food handlers in Kuala Pilah, Malaysia.	This study evaluates the knowledge, attitude and practices (KAP) of food handlers working in restaurants in Kuala Pilah, Malaysia as well as to determine the significant relationship between the sociodemographic characteristics of the food handlers and their KAP. The results show that the food handlers have excellent knowledge and attitude, and good practices toward food hygiene. Even though the result shows satisfactory KAP levels of the food handlers, some aspects on hygiene measures like refreezing food item, clean working area and wearing of jewellery and watch need to be emphasized.
	Tan et al., 2013	A qualitative study on personal hygiene knowledge and practices among food handlers at selected primary schools in Klang valley area, Selangor,	A study was conducted to determine personal hygiene knowledge among 25 food handlers at 12 selected primary schools in Klang Valley area, Selangor, Malaysia. The study showed that the food handlers have basic knowledge on good personal hygiene practices. However, some discrepancies were revealed in the proper hand washing procedure.
	Tan et al., 2013	Hand hygiene knowledge, attitudes and practices among food handlers at	The purpose of this study was to investigate the hand hygiene knowledge, attitudes and

		primary schools in Hulu Langat district, Selangor (Malaysia)	practices of food handlers from 38 primary schools in Hulu Langat district, Selangor State in Malaysia. This study revealed that, although food handlers' hand hygiene knowledge, attitudes and practices (both self-reported and observation) were good, food handlers at primary schools in the Hulu Langat district were lacking in terms of some very basic knowledge and practices. In particular, this study suggests that food handlers' hand hygiene knowledge concerning RTE foods and the existence of bacteria as well as correct hand washing methods should be highlighted.
	Toh P.S.& Birchenough A., 2000	Food safety knowledge and attitudes: culture and environment impact on hawkers in Malaysia. Knowledge and attitudes are key attributes of concern in hawker foodhandling practices and outbreaks of food poisoning and their prevention.	This study determined the impact of culture and environment on knowledge and attitudes of hawkers towards food safety, foodborne illnesses and their prevention. The findings of this study highlight the importance of education to bridge cultural gaps in food safety knowledge and attitudes. A strong relationship exists between the knowledge and attitudes of hawkers.
	Campos et al., 2009	Assessment of personal hygiene and practices of food handlers in municipal public schools of Natal, Brazil.	The aim of this study was to assess the hygienic practices of food handlers in municipal schools of Natal, Brazil. It was concluded that the schools studied did not have appropriate hygienic conditions, suggesting the need for interventions that ensure the quality of school food served to

			the children.
	Green et al., 2006	Food worker hand washing practices: an observation study	The present study was designed to collect detailed observational data on food worker hand washing practices. Given concerns about glove use and the promotion of poor hand washing practices, this study also examined the relationship between glove use and hand washing. The findings suggest that the hand washing practices of food workers need to be improved, glove use may reduce hand washing, and restaurants should consider reorganizing their food preparation activities to reduce the frequency with which hand washing is needed.
	Baş et al., 2006	The evaluation of food hygiene knowledge, attitudes, and practices of food handlers' in food businesses in Turkey.	The purpose of this study was to evaluate knowledge, attitudes, and practices among food handlers with regard to food hygiene in food businesses in Ankara, the capital city of Turkey. As a conclusion, the findings of this study demonstrated that food handlers in food businesses have lack of food safety knowledge. There is an immature need for education and increasing awareness among food handlers regarding safe food handling practices.
Bacterial contamination	Kyriacou et al., 2008	Screening for faecal contamination in primary schools in Crete, Greece.	The goal of this study was to assess the hygienic conditions in primary schools in Heraklion, Crete, Greece, considering both children's hands and environmental surfaces and to investigate possible causal

			relationship. Children's hands were highly infected (52.9%), while boys exhibited higher levels of contamination. The education level of parents correlated well with the contamination of children's hands.
	Kaltenthaler et al., 1995	Faecal contamination on children's hands and environmental surfaces in primary schools in Leeds.	The objective of this study were to determine the relationship between children's hygiene knowledge and presence of faecal contamination on the hands, to explore the association between faecal contamination on children's hands and specific school variables and to determine which areas within the toilet facilities and classroom were faecally contaminated. There are few conclusions were suggested. These are: (1) children with better hygiene knowledge had less faecal contamination on their hands; (2) schools drawing children from deprived areas showed higher levels of faecal contamination on children's hands; (3) schools where children had higher levels of faecal contamination on the hands were more likely to have reported an outbreak of gastro-intestinal infection in the past; and (4) classroom carpets were often faecally contaminated.
	Judah et al., 2009	Dirty hands: bacteria of faecal origin on commuters' hands	This exploratory study was to provide a survey of contamination on the hands of commuters to gauge the importance of hands as routes of transmission of bacteria of

			potential faecal origin in the broad United Kingdom population. The results of this exploratory study indicate that hand hygiene practices in the United Kingdom may be inadequate and that faecal indicator bacteria on hands may be used to monitor the effect of hand-washing promotion campaigns.
	Ayçiçek et al., 2004	Assessment of the bacterial contamination on hands of hospital food handlers.	This study was performed in order to determine the level of bacterial contamination on the hands of food handlers (n = 30) who work in the kitchen of a military training hospital. As a result, the poor hand hygiene and improper glove use by the food handlers was emphasized and concluded that the training in personal hygiene and food safety should be improved.

CHAPTER 3

METHODOLOGY

3.1 **Study design**

A cross-sectional study was conducted to assess the hygienic practices among food handlers in primary and secondary schools in Setapak, Wilayah Persekutuan Kuala Lumpur, considering food handler's hands hygiene and glove usage practices as well as to investigate the possible causal relationship.

3.2 Study location

This study was conducted at nine (9) schools located in Setapak, Wilayah Persekutuan Kuala Lumpur. Figure 3.1 depicts the location of the study.

Figure 3.1: Location of the study.

3.3 Study Population

The populations of this study were among the food handlers who work at respective selected primary and secondary school canteens in Setapak, Wilayah Persekutuan Kuala Lumpur.

3.4 Sampling

3.4.1 Study Sample

The samples for this study were among the food handlers at selected primary and secondary school canteens.

3.4.2 Sample Size

Sample size calculation was based on prevalence reported from previous study. Tan et al, (2013) has reported that 80% of food handlers surveyed in school food

premises were practicing a good personal hygiene. The sample size formula (Daniel, 1999) used is shown as follows:

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

Where,

n = sample size

Z = Z statistic for a level of confidence (95% CI = 1.96 Z value)

P = expected prevalence or proportion

d = precision

Hence, the sample size for this study is:

$$n = \frac{1.96^2 \times 0.8 \times (1 - 0.8)}{0.1^2}$$

= 61 food handlers

The dropouts of 10% from 61 food handlers will yields extra 6 people. The dropouts of 10% were taken in order to anticipate any missing data or non-response rate. Thus, the total sample size of this study was 67 food handlers in selected primary and secondary school canteens.

3.4.3 **Sampling Method**

Simple random sampling technique was applied for selection of food handlers in selected primary and secondary school canteens.

3.4.4 **Sampling Unit**

The sampling unit for this study was the food handlers of selected primary and secondary school canteens.

3.5 **Study Instrumentation**

3.5.1 **Questionnaire**

An eight-page written questionnaire consisting of 39 closed and open ended questions was adapted and modified using questions based on a previous study (Tan et al., 2013) to assess the level of hygienic practices among the food handlers. The variables included in the questionnaire were separated into four (4)

parts. Part A asked about sociodemographic information of food handlers while Part B based on health status of food handlers. The sociodemographic information of food handlers consist of gender, age, ethnicity, level of education, working periods (years), and income status.

In part C asked about questions related to hand hygiene knowledge of the food handler. Regarding to the hand hygiene knowledge, it were divided into two aspects; personal hygiene and cross-contamination. The food handlers were requested to select true or false for each statement. For each statement, the correct answer was awarded with 1 point per each statement, whereas the wrong answer was awarded with zero points. The score for this part ranged from zero to 13 points and then converted to percentages.

Finally, part D explored the hand hygiene practices among food handlers of school canteens which focusing on hand washing and glove usage practice. In this part, the food handlers were requested to answer 'yes' or 'no' for every question regarding to their hand washing and glove usage practices. For each correct answer, one point was awarded, whereas zero point was awarded to each wrong answer. The score for this part ranged between zeros to 16 points and were converted to percentages. The mean scores obtained for knowledge and self-reported hand hygiene practices were considered good if above 50% and bad if below 50% (as cited in Tan et al., 2013).

3.5.2 **Hygiene practice checklist**

A written hygiene practice checklist was also adapted and modified from previous study (Tan et al, 2013). The checklist was used to observe the hygiene practices among the food handlers. Any kinds of activities that do not observe during that assessment were indicating as NOB (not observed).

3.6 **Data collection**

3.6.1 **Questionnaire distribution**

At the sampling location, the modified questionnaire based on previous study (Tan et al, 2013) was distributed to each food handlers at selected primary and secondary schools. Before it was distributed, the food handlers were informed with the purpose of this research and consent forms were then distributed to be filled by them. At the same time, face to face interview was also conducted to each food handlers in order to avoid any information bias. Questionnaires were distributed in the afternoon after recess periods at the

selected primary and secondary schools to avoid interruptions. Each respondent was assigned a four-digit code and was given 10 - 20 minutes to complete the interview.

3.6.2 **Hygiene practice checklist**

In addition to that, a thorough observation was conducted by using a checklist based on previous study (Tan et al., 2013) to assess the hygienic practices among food handlers.

3.7 **Quality Control**

3.7.1 **Pre-test of questionnaire**

The questionnaire of this study was piloted by 15 respondents among food handlers to confirm question reliability and validity. Apart from that, sample of questionnaire survey was taken to the MOH's authorized government officers for their comments and improvement. The comments were carefully

noted and rephrased. This type of validity is needed in order to ensure the clarity of the question items for the targeted food handlers' in the institutions which under the MOH's control.

3.8 **Statistical Analysis**

Data gathered was analyzed by using the Statistical Package Social Sciences, Version 22.0 for Windows (SSPS, Chicago, IL). Descriptive statistical (means, percentages, standard deviations and frequencies) was used for all variables. These includes the socio-demographic profiles of the school-based food handlers which comprises of gender, ethnicity, age groups, period of working, level of education, and income status.

In addition, both parametric and non-parametric test were used to compare the mean scores for hand hygiene knowledge and practices among the sociodemographic variables of food handlers. Pearson correlation will be used to identify the relationships among the mean total score of hand hygiene knowledge and practices. The statistical significance for all tests was set at the level of $p \leq 0.05$.

3.9 **Ethical Issues**

Prior to the interview and thorough observation, the respondents were given a full clarification about the research and consent form to be filled by them. There was no biological samples were taken among the respondents in this study. At the same time, the protocol that involved throughout this research was approved by the ethic committee of Universiti Putra Malaysia (JKEUPM).

3.10 **Study Limitation**

There are several limitations in this study. First and foremost, the study design of this study may not possibly representative without complete list of population members. Since simple random sampling is used in this study, the selection of school canteens and food handlers may potentially uneconomical to achieve and yet the time-scale may be too long to conduct. As a result of that, the sample or data could be change from time to time.

At the same time, findings from food handler's knowledge and practices on hand hygiene can be varies from one person to another due to differences in level of education. This may lead to information bias thus affecting the overall findings. Some of the

respondents tend to perform better than the others in regards to certain questions that required them to think wisely on certain situation. Level of understanding of each respondent towards question given could be different from others. Hence, they tend to answers the question without understanding the need of those questions.

Besides that, that the interview session with the food handlers can be time consuming where several questions and statements need to be read for a few times since some of them still confused with it. At the same time, technical terms that included in the questionnaire were also explained to them. Nevertheless it is still confined to a single interviewer to conduct the interview. Hence, this limitation can be improved by increasing the number of interviewer who will conduct the interview with the food handlers. In order to limit any misleading information, the interviewer will be train first before conducting any interview session.

In addition, this study only focuses on the knowledge and self-reported practices of food handlers on hand hygiene. It order to determine the hand hygiene practices among food handlers, it is recommended that their attitudes should also be included. Previous study show significant correlation between attitudes and knowledge, as well as attitudes with practices. Thus, attitudes aspects on hand hygiene should be included as well in this study to assess their overall hygienic practices on hand hygiene.

CHAPTER 4

RESULTS

Results of this research were divided based on the findings from general hygiene checklist and questionnaires. The questionnaire consists of four (4) parts which is part A (Socio-demographic information), part B (Health information), part C (Hand hygiene knowledge), and part D (Hand hygiene practices).

This study was conducted at nine selected primary and secondary schools located in Setapak, Wilayah Persekutuan Kuala Lumpur. In this study, a total of 67 respondents were randomly selected among school canteen food handlers to assess their knowledge and practices on hand hygiene. The collection of data for this study consists of 2 stages; 1) face to face interview by using a modified questionnaire from previous study (Tan et al., 2013) to assess the level of hygienic practices among the food handlers; 2) thorough observation of hand hygiene practices among food handlers by using modified checklist

from previous study (Tan et al., 2013. The findings of the assessment were displayed as follows.

4.1 Socio-demographic profile of school canteen food handlers

Table 4.1depicts the sociodemographic profiles of respondents who took part in this study. Among the 67 food handlers that participated in this study, the majority (55.2%) were in the age range of 31 - 40 and female (73.1%). All of the respondents who took part in this study were Malays (100%). Additionally, more than half of the respondents (64.2%) completed their secondary schools as their highest level of education. This was followed by primary school (20.9%), diploma (10.4%) and no formal education depicts the least with 4.5%.

Food handlers with working experience between 1 to 5 years of experience comprised the highest percentage, 41.8%, slightly followed by 6 to 10 years of working experience (38.8%), 11 to 15 years working experience (10.4%) and less than 1 year working experience (9.0%) depicts the lowest. However, notice that there were no respondents were over 15 years of working experience that took part in this study. Besides that, respondents were also asked on the income status per month. Majority (55.2%) of the income status were in the range between RM 1000 and RM 1500 per month, followed

by RM 500 - RM 1000 with 38.8% and range between RM 1500 and RM 2000 depict the least with 6.0%.

Table 4.1: Socio-demographic profiles of food handlers (n = 67)

No.	Socio-demographic profiles		n	(%)
1.	Gender	Male	18	26.9
		Female	49	73.1
2.	Age groups	20 - 30	16	23.9
		31 - 40	37	55.2
		41 - 50	14	20.9
		51 - 60	0	0
		More than 60	0	0
3.	Ethnicity	Malays	67	100
		Indian	0	0
		Chinese	0	0
		Others	0	0
4.	Level of education	No formal education	3	4.5
		Primary school	14	20.9
		Secondary school	43	64.2
		Diploma	7	10.4
5.	Working period (years)	Less than 1	6	9.0
		1 - 5	28	41.8
		6 - 10	26	38.8
		11 - 15	7	10.4
		More than 15	0	0
6.	Income status	< RM 500	0	0
		RM 500 - RM 1000	26	38.8

	RM 1000 - RM 1500	37	55.2
	RM 1500 - RM 2000	4	6.0
	≥ RM 2000	0	0

4.2 Knowledge on hand hygiene among school canteen food handlers.

One of the purposes of this study is to assess the knowledge on hand hygiene among the food handlers. Table 4.2 depicts the frequency and means percentage score of the food handlers' knowledge on hand hygiene specifically focus to personal hygiene and cross-contamination. As an overall, the mean hand hygiene knowledge percentage score was 95.75 ± 6.99 (Table 4.2), which was considered good as it is above 50% (Tan et al., 2013). Based on table 4.2, knowledge on cross-contamination depicts the highest mean percentage scores (97.01 ± 6.83), followed by knowledge on personal hygiene with mean percentage scores of 94.03 ± 9.49.

Regarding on the knowledge on cross-contamination, most of the food handlers agree with the statements regarding to the use of clean aprons, washing hands and not wearing jewelleries during food preparation as the best steps in minimizing the risk of food-contamination. In addition to that, more than 90% of the food handlers were knowledgeable on the aspects of the usage of gloves (98.5%), raw food with 95.5% and

94.0% respectively and wearing caps or hairnets (91.0%) in minimizing the risk of food contamination.

Besides that, knowledge on hand hygiene covered the personal hygiene knowledge among the food handlers. Based on table 4.2, the mean percentage score of food handlers on personal hygiene point was 94.03 ± 9.49. All of the food handlers agreed that practicing good personal hygiene and frequent hand washing during and after food preparation is essential in minimizing the risk of food contamination. In addition to that, most of them believe that wearing accessories (jewellery, watches) during preparation of RTE foods should not be worn as it may carry different kinds of contagious bacteria. Moreover, many of the food handlers were knowledgeable on the risk associated with dirty fingernails (97.0%), cuts on fingers or hands (85.1%) and hair as a primary source of food contamination (82.1%).

Table 4.2: Food handlers' knowledge towards hand hygiene (n = 67)

No.	Statements	Respondents, n (%)		Mean ± SD[a]
		True	False	
Personal hygiene				
1.	Practicing good personal hygiene reduces the risk of food poisoning	67(100.0)	0(0)	94.03 ± 9.49
2.	Accessories (jewellery,watches) should not be worn during preparation of RTE	67(100.0)	0(0)	

	foods as it may carry different kinds of contagious bacteria			
3.	Frequent hand washing during and after food preparation is essential in minimizing the risk of food contamination	67(100.0)	0(0)	
4.	Human hair is the primary source of food contamination	55(82.1)	12(17.9)	
5.	Dirty fingernails carry different kind of harmful bacteria	65(97.0)	2(3.0)	
6.	Cuts on hands or fingers carry millions of harmful bacteria	57(85.1)	10(14.9)	
Cross-contamination				
9.	Raw food contain harmful bacteria which spread rapidly to anything it touches	64(95.5)	3(4.5)	97.01 ± 6.83
10.	Combination of RTE food and raw food can lead to cross contamination	63(94.0)	4(6.0)	
11.	Wearing gloves when handling RTE foods can reduce the risk of food contamination	66(98.5)	1(1.5)	
12.	Wearing a clean apron reduces the risk of food contamination	67(100.0)	0(0)	
13.	Wearing caps or hair net can reduces the risk of food contamination	61(91.0)	6(9.0)	
14.	Wearing accessories (jewellery,watches) can increase the risk of food contamination	67(100.0)	0(0)	
15.	Washing hands before preparing and handling RTE foods can reduces the risk of food contamination	67(100.0)	0(0)	

[a] Standard deviation; mean percentage scores of hand hygiene knowledge = 95.75 ± 6.99.

4.3 Self-reported hand hygiene practices among school canteen food handlers.

Furthermore, this study was conducted to determine the level of hand hygiene practices among food handlers. Hand hygiene practices among food handlers were assessed based on their self-reported practices in maintaining good hand hygiene condition. Table 4.3 indicates the frequency and means percentage scores of food handlers on self-reported hand hygiene practices. As an overall, the mean percentage score of self-reported hand hygiene practices was 86.96 ± 9.47 (Table 4.3), which was also considered as good as it is above 50% (Tan et al., 2013). Glove usage practices among food handlers had the highest mean percentage scores (86.99 ± 18.05), followed by hand washing practices (86.91 ± 7.71).

Based on the findings in table 4.3, most of the food handlers report that they washed their hands after visiting restroom, before preparing food, before and after preparing raw materials, as well as after eating or drinking. This is indicates that they did practice a positive behaviors regarding to hand hygiene practices. However, there are several matter need to be consider attentively regarding to negative behaviors in hand hygiene practices. Surprisingly, most of the food handlers did not wash their hand after sneezing/ coughing/ blowing nose (4.5%); some did not wash their hands after handling rubbish or other waste (13.4%), around 65.7% did not wash hands after touching their face, hair, or clothes. In addition to that, there are even some of them did not wash their hands with

soap before and after preparing food (32.8%). Thus, these matters need further attention and action as it may possess to major risk to food contamination.

In terms of glove usage, a high percentage of the food handlers in this study (91.0%) reported that they did wear gloves when their hands have cuts. Apart from that, a percentage of 89.6% of food handlers reported wear gloves while preparing food and around 79.1% of them reported that they did wear gloves while preparing raw materials. When the food handlers were asked on the statements where 'The use of gloves can reduce the risk of food contamination', around 89.6% of the food handlers reported to be agree with the statement. However, there were few matter need to be consider attentively where few of the food handlers did not change their gloves after preparing raw materials (3.0%) as they believe that changing gloves after preparing raw materials is sort of wasting behaviours. Hence, further attention need to be attentively considered as this kind of behavior might affect the quality of the food thus affecting the consumer as well.

Table 4.3: Food handlers' self-reported hand hygiene practices (n = 67)

No.	Questions	Respondents, n (%)		Mean ± SD[a]
		Yes	No	
Hand washing				
1.	Do you wash your hands after visiting restroom?	67(100.0)	0(0)	86.91 ± 7.71
2.	Do you wash your hands before preparing food?	67(100.0)	0(0)	

3.	Do you wash your hands before and after preparing raw materials?	67(100.0)	0(0)	
4.	I do not wash my hand after sneezing/ coughing/ blowing nose. (-)	3(4.5)	64(95.5)	
5.	Do you wash your hands after eating or drinking?	67(100.0)	0(0)	
6.	Do you wash your hands after touching your face, hair, or clothes?	23(34.3)	44(65.7)	
7.	I do not wash my hands after handling rubbish or other waste. (-)	9(13.4)	58(86.6)	
8.	I do not wash my hands after handling between raw food and food that is ready to eat. (-)	1(1.5)	66(98.5)	
9.	Do you wash your hands with soap before and after preparing food?	45(67.2)	22(32.8)	
Glove use				
10.	Do you wear gloves while preparing food?	60(89.6)	7(10.4)	86.99 ± 18.05
11.	Do you wear gloves while preparing raw materials?	53(79.1)	14(20.9)	
12.	Do you wear gloves when your hands have cuts?	61(91.0)	6(9.0)	
13.	Do you wash your hands after changing gloves?	45(67.2)	22(32.8)	
14.	The use of gloves can reduce the risk of food contamination.	58(86.6)	9(13.4)	
15.	I do not change my gloves after preparing raw materials. (-)	2(3.0)	65(97.0)	
16.	I do not change my gloves even it is damaged or dirty. (-)	0(0)	67(100.0)	

[a] Standard deviation; mean percentage scores of hand hygiene practices = 86.96 ± 9.47.

4.4 Observation on hand hygiene practices among school canteen food handlers.

In addition to face to face interview with the food handlers, thorough observation also being conducted to assess the hand hygiene practices by using modified checklist from previous study (Tan et al, 2013). The results from the observational study were reported in Table 4.4. As an overall, most of the food handlers practice a good hand hygiene practices. It is noted that 95.5% of the food handlers did wear clean and appropriate uniforms, followed by 98.5% of them wear caps or hair nets during food handling and preparation, and 85.1% of the respondents wear gloves when handling RTE food. Besides that, around 76.1% were noticed did not wear any accessories (jewelleries, watches) while handling food and top of that, more than 90% of the food handlers have short and clean fingernails (94.0%) which considered as a best practice.

However, there are some aspects of practices among food handlers were considered as bad practices. For instance, almost all of the food handlers (97.0%) were observed do not wear any masks during handling and preparation of food. Besides that, 13.4% of the respondents were notice did not eat, drink, or chewing gum at the designated area which away from food preparation. Even though most of the food handlers did not wear accessories and wear gloves during handling of RTE foods, there were still few of them did not wear gloves (14.9%) and wear accessories (23.9%) while handling RTE foods.

Table 4.4: Observed hand hygiene practices among school canteen food handlers (n = 67)

No.	Observed practices	Respondents, n (%)		
		Yes	No	NOB[a]
1.	Employees wear clean and appropriate uniforms	64(95.5)	3(4.5)	0(0)
2.	Employees wear appropriate shoes	57(85.1)	10(14.9)	0(0)
3.	Employees wear clean protective garment (apron)	63(94.0)	4(6.0)	0(0)
4.	Employees wear caps or hair nets	66(98.5)	1(1.5)	0(0)
5.	Employees wear masks	2(3.0)	65(97.0)	0(0)
6.	Accessories (jewellery,watches) is not worn when handling food	51(76.1)	16(23.9)	0(0)
7.	Fingernails are short and clean	63(94.0)	4(6.0)	0(0)
8.	Smoking only occurs in designated areas away from food	0(0)	0(0)	67(100.0)
9.	Employees wear gloves when handling RTE food	57(85.1)	10(14.9)	0(0)
10.	Employees wash hands before using gloves or handling RTE foods	52(77.6)	5(7.5)	10(14.9)
11.	Employees wash hands after using gloves or handling RTE foods	54(80.6)	2(3.0)	11(16.4)
12.	Employees change gloves or wash hands between handling raw and RTE	9(13.4)	12(17.9)	46(68.7)
13.	Employees wash hands after returning from the toilet	0(0)	0(0)	67(100.0)
14.	Eating, drinking, or chewing gum occur only in designated areas away from food preparation	0(0)	9(13.4)	58(86.6)
15.	Employees wash hands after handling waste food or rubbish	2(3.0)	0(0)	65(97.0)

16.	Employees with infections are restricted or excluded	0(0)	0(0)	67(100)
17.	Employees wash hands after nose-wiping or starching body parts	0(0)	2(3.0)	65(97.0)

[a]Not observed during the assessment.

4.5 The influences of food handlers' sociodemographic profiles on hand hygiene.

Table 4.5 indicates the influences of food handlers' sociodemographic profiles on their hand hygiene knowledge and hand hygiene practices. According to the table 4.5, the sociodemographic profiles variables with statistically significant effects on hand hygiene aspects were gender, level of education, and income status. In the aspects of hand hygiene knowledge, it was noted that there was a significant difference in the mean personal hygiene score among different level of education (χ^2 (6) = 13.847, p = 0.031).

Meanwhile, it was noted that gender was found to be significantly affect the hand hygiene self-reported practices (U = 237.000, p = 0.002). Regarding to the glove usage practice, the mean ranks of glove usage practices differed significantly by gender of the food handlers (U = 263.500, p = 0.006). In addition to that, income status does significantly affect the glove usage practice (χ^2 (10) = 25.956, p = 0.004).

Table 4.5: Influences of food handlers' sociodemographic profiles on hand hygiene (n = 67)

Aspects	Gender	Age	Education level	Working period	Income status
Hand hygiene knowledge	0.208	0.225	0.224	0.233	0.826
1. Personal hygiene	0.125	0.350	**0.031**	0.476	0.809
2. Cross-contamination	0.975	0.103	0.809	0.542	0.447
Hand hygiene self-reported practices	**0.002**	0.412	0.555	0.556	0.443
1. Hand washing	0.538	0.861	0.221	0.320	0.608
2. Glove use	**0.006**	0.068	0.274	0.103	**0.004**

Bold values are statistically significant at $p < 0.05$.

4.6 Pearson correlation among food handlers' hand hygiene knowledge and self-reported practices.

Table 4.6 indicates the correlation among food handlers' hand hygiene knowledge and self-reported practices of food handlers. Based on the findings in table 4.6, knowledge on personal hygiene had a significant relationship with knowledge on cross-contamination ($r = 0.500$, $p = 0.000$), and glove use ($r = 0.424$, $p = 0.000$). Besides that, it was noted that knowledge of cross-contamination had a significant relationship with knowledge on personal hygiene ($r = 0.500$, $p = 0.000$), and glove use ($r = 0.307$, $p = 0.011$).

Furthermore, based on the findings in Table 4.6, there was a significant relationship on glove usage practices with personal hygiene knowledge ($r = 0.424$, $p = 0.000$), and knowledge on cross-contamination ($r = 0.307$, $p = 0.011$). In general, it was also noted that there was a significant relationship between mean hand hygiene knowledge and practices scores ($r = 0.403$, $p = 0.001$).

Table 4.6: Pearson correlation among food handlers' hand hygiene knowledge and self-reported practices (n = 67)

Aspects	Hand hygiene knowledge	Personal hygiene	Cross - contamination	Hand hygiene self-reported practices	Hand washing	Glove use
Hand hygiene knowledge	-					
Personal hygiene	0.870**	-				
Cross contamination	0.846**	0.500**	-			
Hand hygiene self-reported practices	0.403**	0.418**	0.267**	-		
Hand washing	0.105	0.142	0.02	0.561**	-	
Glove use	0.426**	0.424**	0.307*	0.890**	0.122	-

** Correlation is significant at $p < 0.01$
* Correlation is significant at $p < 0.05$

CHAPTER 5

DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1 **Discussion**

5.1.1 Socio-demographic profile of school canteen food handlers

Among the 67 food handlers that participated in this study, the majority (55.2%) were in the age range of 31 - 40 and female (73.1%). It was noted that most of the food handlers were more female than male food handlers as stated in previous study (Abdul-Mutalib et al., 2012). Most of the respondents who took part in this study were Malays (100%). Additionally, more than half of the respondents (64.2%) completed their

secondary schools as their highest level of education. This is followed by primary school (20.9%), diploma (10.4%) and no formal education depicts the least with 4.5%.

Food handlers with working experience between 1 to 5 years of experience comprised the highest percentage, 41.8%, slightly followed by 6 to 10 years of working experience (38.8%), 11 to 15 years working experience (10.4%) and less than 1 year working experience (9.0%) depicts the lowest. However, notice that there were no respondents were over 15 years of working experience that took part in this study. Besides that, respondents were also asked on the income status per month. Majority (55.2%) of the income status were in the range between RM 1000 and RM 1500 per month, followed by RM 500 - RM 1000 with 38.8% and range between RM 1500 and RM 2000 depict the least with 6.0%.

5.1.2 Knowledge on hand hygiene among school canteen food handlers.

One of the purposes of this study is to assess the knowledge on hand hygiene among the food handlers. Table 4.2 depicts the frequency and means percentage score of the food handlers' knowledge on hand hygiene specifically focus to personal hygiene and cross-contamination. As an overall, the mean hand hygiene knowledge percentage score was 95.75 ± 6.99 (Table 4.2), which was considered good as it is above 50% (Tan et al., 2013). Based on table 4.2, knowledge on cross-contamination depicts the highest

mean percentage scores (97.01 ± 6.83), followed by knowledge on personal hygiene with mean percentage scores of 94.03 ± 9.49.

Regarding on the knowledge on cross-contamination, most of the food handlers agree with the statements regarding to the use of clean aprons, washing hands and not wearing jewelleries during food preparation as the best guidelines in preventing food contamination. In addition to that, 95.5% of food handlers in this study knew that raw food contain harmful bacteria which spread rapidly to anything it touches. As previous conducted by Gorman, Bloomfield, and Adley (2002), it stated that microorganisms are capable of travelling from raw food to hands and other food contact surfaces in domestic kitchens. This showed that hands can be an important vehicle in channeling those microorganisms.

Besides that, knowledge on hand hygiene covered the personal hygiene knowledge among the food handlers. Based on table 4.2, the mean percentage score of food handlers on personal hygiene point was 94.03 ± 9.49. All of the food handlers agreed that practicing good personal hygiene and frequent hand washing during and after food preparation is essential in minimizing the risk of food contamination. In addition to that, most of them believe that wearing accessories (jewellery, watches) during preparation of RTE foods should not be worn as it may carry different kinds of contagious bacteria. Moreover, 85.1% of food handlers knew that cuts on hands or fingers may carry millions of harmful bacteria. As compared to previous study

conducted by Tan et al. (2013), the percentage was relatively higher by 94.1 % where food handlers knew regarding to the possibilities of cuts on hands or fingers that carry millions of harmful bacteria.

5.1.3 Self-reported hand hygiene practices among school canteen food handlers.

Hand hygiene practices among food handlers were assessed based on their self-reported practices in maintaining good hand hygiene condition. Table 4.3 indicates the frequency and means percentage scores of food handlers on self-reported hand hygiene practices. As an overall, the mean percentage score of self-reported hand hygiene practices was 86.96 ± 9.47 (Table 4.3), which was also considered as good as it is above 50% (Tan et al., 2013). Glove usage practices among food handlers had the highest mean percentage scores (86.99 ± 18.05), followed by hand washing practices (86.91 ± 7.71).

Rates of food handlers' hand washing were relatively higher in this study, which suggesting that they know when to wash their hands. Based on the findings in table 4.3, most of the food handlers report that they washed their hands after visiting restroom, before preparing food, before and after preparing raw materials, as well as after eating or drinking. A study by Green et al. (2006) found that attempted and appropriate hand washing rates were significantly higher before food preparation than in conjunction with

other work activities. These results are not surprising as washing hands before preparing foods, after visiting restroom, before and after preparing raw materials, as well as after eating or drinking are likely the best known guidelines in hand washing. Washing hands after visiting restroom is crucial as it can be an important vehicle for transmitting microorganism. A study by Taylor et al. (2000) proved that the transfer of microorganism to the hands was due to poor personal hygiene after visiting the toilet. Hence, these indicate that they are aware that foods need to be protected from possible contamination from hands.

Surprisingly, some of the food handlers did not wash their hand after sneezing/ coughing/ blowing nose (4.5%). Compared to the previous study by Tan et al. (2013), 8.0% of the food handlers in Klang valley did not wash their hands after sneezing, coughing or blowing their nose. This improper practice could lead to the risk of food contamination. Besides that, around 65.7% did not wash hands after touching their face, hair, or clothes. Green et al. (2006) also found that attempted and appropriate hand washing rates tended to be significantly lower after touching body parts than in conjunction with other activities. In this case, food handlers may not consider it feasible for them to stop their work and wash their hand. At the same time, they might not even realize when and how they touched themselves.

In addition to that, there are even some of them did not wash their hands with soap before and after preparing food (32.8%). Frequent hand washing is one of the best

ways to avoid getting sick and spreading illness. Washing hand with only water was not enough in eliminating microbial loads at the surface of our hands. At least, with an addition of soap or an alcohol-based hand sanitizer can help limit the transfer of bacteria, viruses and other microbes. Hence, this intervention at least can limit the risk of food contamination.

In terms of glove usage, a high percentage of the food handlers in this study (91.0%) reported that they did wear gloves when their hands have cuts compared to 88.0% of food handlers in Klang valley, Selangor, Malaysia as reported by Tan et al. (2013). In some cases, food handlers with open cuts or wounds on the exposed parts of their bodies should not be allowed to handle food. Some food poisoning microorganism especially bacteria are commonly found on open wounds or cuts on their bodies and once get contacted with surfaces of cooking utensils and foods; it is eventually contaminating the entire quality of those foods and cooking utensils.

Apart from that, a percentage of 89.6% of food handlers reported wear gloves while preparing food and around 79.1% of them reported that they did wear gloves while preparing raw materials. These suggest that the food handlers are aware with the important of using gloves in avoiding cross-contamination occurrence in food product. As compared to previous study conducted by Tan et al. (2013), around 84.0% and 72.0% of food handlers whom using glove while preparing food and preparing raw material respectively. However, there were few matter need to be consider attentively where few

of the food handlers did not change their gloves after preparing raw materials (3.0%) as they believe that changing gloves after preparing raw materials is sort of wasting behaviours. Hence, further attention need to be attentively considered as this kind of behavior might affect the quality of the food thus affecting the consumer as well.

5.1.4 Observation on hand hygiene practices among school canteen food handlers.

In addition to face to face interview with the food handlers, thorough observation also being conducted to assess the hand hygiene practices by using modified checklist from previous study (Tan et al, 2013). The results from the observational study were reported in Table 4.4. As an overall, most of the food handlers practice a good hand hygiene practices. It is noted that almost all of the food handlers did wear clean and appropriate uniforms, wears caps or hair nets during food handling and preparation and wear gloves when handling RTE food. Besides that, it is also noticed that there is only several food handlers worn accessories (jewelleries, watches) while handling food. More than 90% of the food handlers have short and clean fingernails compared to 58.3% in Miranda et al. (2002) (as cited in Campos et al., 2009) and 18.5% in Campos et al. (2009). Thus, these findings suggest that most of the food handlers do practicing a good hygiene practices in minimizing the risk of food contamination.

However, there are some aspects of practices among food handlers were considered as bad practices. For instance, almost all of the food handlers (97.0%) were observed do not wear any masks during handling and preparation of food. This finding also similar from previous study conducted by Tan et al. (2013) where 98.8% of food handlers in Hulu Langat district, Selangor were observed did not wear masks while handling RTE foods. It is suggested that wearing masks is the most possible way in preventing contaminants from nose and mouth get into the foods while food preparation and handling of RTE foods. As stated by de Leon, Meacham, and Claudio (2003), 'hand habits' which are automatic hand movements, such as touching one's face, rubbing one's nose and starching an itch are capable of transmitting contagious microorganism from those food handlers which their hands were originally contaminated.

Even though most of the food handlers did not wear accessories and gloves during handling of RTE foods, there were still few of them did not wear gloves (14.9%) and wear accessories (23.9%) while handling RTE foods. As compared to previous study by Tan et al. (2013), the food handlers in Hulu Langat district wore jewellery when handling RTE foods was 27.1% which greater than this present study as well as findings reported by Miranda, Damasceno, and Cardonha (2002) where 12.5% of food handlers in Natal, Brazil wore jewellery while handling RTE foods (as cited in Campos et al., 2009). However, 54.7% of food handlers in Kuala Pilah wore jewellery and a watch while working as stated in the previous study conducted by Abdul-Mutalib et al. (2012).

Wearing jewelleries, watches, pins or other accessories should be prohibited while preparing foods. Based on Food Hygiene Regulations 2009, part IV, section 33(1) (f), it states that a food handler while handling, preparing, packing, carrying, storing, displaying and serving of food shall not wear jewelleries, watches, pins or other accessories. Although the regulations had been implemented, this event is still unavoidable as they still using it especially watches which is essential for them to keep in track and ease their work.

5.1.5 The influences of food handlers' sociodemographic profiles on hand hygiene.

Table 4.5 indicates the influences of food handlers' sociodemographic profiles on their hand hygiene knowledge and hand hygiene practices. The sociodemographic profiles variables that statistically significant effects on hand hygiene aspects were gender, level of education, and income status. In the aspects of hand hygiene knowledge, it was noted that there was a significant difference in the mean personal hygiene score among different level of education (χ^2 (6) = 13.847, p = 0.031). Previous study by Tan et al. (2013), Jianu and Chris (2012) and Toh and Birchenough (2000) also reported that food handlers' knowledge of hygiene was influenced by their education level. However, a study conducted by Abdul-Mutalib et al. (2012) found that there is no significant difference in food handlers' food hygiene and sanitation knowledge by their level of education.

Meanwhile, it was noted that gender was found to be significantly affect the hand hygiene self-reported practices (U = 237.000, p = 0.002). The mean ranks of hand hygiene self-reported practices differed significantly by gender where female self-reported hand hygiene practices were better compare to male food handler. Regarding to the glove usage practice, the mean ranks of glove usage practices also differed significantly by gender of the food handlers (U = 263.500, p = 0.006). Female food handlers tend to wore gloves when preparing raw foods and handling RTE foods compared to male food handlers.

In addition to that, income status does significantly affect the glove usage practice (χ^2 (10) = 25.956, p = 0.004). This finding suggests that, the attempted glove usage practice is worn more by food handlers whom working in the better facilities compared to the others. It is widely acknowledged that individual income is a powerful determinant of individual health (Subramanian & Kawachi, 2004). Individual with higher income status are linked to better health status as their tends to get access to better health care opportunities compared to those with lower income status. Thus with the higher income status, food handlers tends to worn gloves when preparing raw foods and handling RTE foods where they believe that by wearing gloves it can minimize the potential risk of food contamination which eventually may affect their health status.

5.1.6 Pearson correlation among food handlers' hand hygiene knowledge and self-reported practices.

. Based on the findings in table 4.6, knowledge on personal hygiene had a significant relationship with knowledge on cross-contamination ($r = 0.500$, $p = 0.000$), and glove use ($r = 0.424$, $p = 0.000$). Besides that, it was noted that knowledge of cross-contamination had a significant relationship with knowledge on personal hygiene ($r = 0.500$, $p = 0.000$), and glove use ($r = 0.307$, $p = 0.011$). When the food handlers' cross-contamination knowledge increased, their awareness on the importance of personal hygiene also increases. Hence, they tend to use gloves more often in order to minimize the risk of cross-contamination.

Furthermore, based on the findings in Table 4.6, there was a significant relationship on glove usage practices with personal hygiene knowledge ($r = 0.424$, $p = 0.000$), and knowledge on cross-contamination ($r = 0.307$, $p = 0.011$). In general, it was also noted that there was a significant relationship between mean hand hygiene knowledge and practices scores ($r = 0.403$, $p = 0.000$). Hand hygiene knowledge mean scores were directly proportional to the hand hygiene practices scores. Previous study by Abdul-Mutalib et al. (2012) also reported significant correlation between knowledge and practice ($p = 0.007$). However, this finding was in contrast to the findings of Ansari-Lari et al. (2010) where noted that the hand hygiene knowledge was inversely

proportional to hand hygiene practice ($r = -0.20$, $p = 0.04$). They conclude that even though the food handlers perceived higher knowledge, they still lacking in practicing good hygiene practice.

5.2 **Conclusion**

This study revealed that 95.5% of food handlers that took part in this study met the satisfactory level on hand hygiene knowledge and practices. Although the food handlers' hand hygiene knowledge and practices with both self-reported and observation were good, 10% of the food handlers still lacking in terms of maintaining good hand hygiene practices and basic knowledge on hand hygiene. Apart from that, there was also some of the hand hygiene aspects need to be emphasized; in particular such as 97.0% of food handlers observed does not masks and 76.1% of them wearing accessories (jewelleries, watches) while preparing and handling RTE foods. These kinds of acts may lead to the increase potential in channeling microorganisms to food thus increasing the rate of cross-contamination and incidence of food contamination among consumer. In order to improve hand hygiene practices, the government shall draw a lot more attention to the importance of wearing gloves while preparing and handling RTE foods. Proper used of gloves between handling raw foods and RTE foods should be emphasized so that the risk of food contamination can be minimized. Continuous education and training should be emphasized to strengthen their knowledge with regards to their field of interest.

5.3 **Recommendation**

There are several recommendations that can be considered to improve the hygienic practices among the school canteen food handlers. It is important that food handlers' knowledge and practices should be continuously assessed in order to meet the KAP satisfactory level. First and foremost, attention should be given to the needs of implementing continuous education and training services to the food handlers. The input of the services should be well maintained and directed to the area of interest. In particular, hand hygiene practices can be strengthen by continuous assessment and evaluation among food handlers regarding to their daily hand hygiene practices while preparing and handling RTE foods.

In this case, government or any interested party should give their full commitment in monitoring food handlers' performance on knowledge, attitudes as well as practices. In addition to that, concerned parties such as NGOs should also play their roles to educate and create awareness on the impact food contamination to the society. Topics on food safety and food hygiene should be covered in every institution in order to educate the schoolchildren as well regarding to the importance in food hygiene and food safety in preventing food contamination. Thus, this eventually reducing risk of foodborne illness.

Furthermore, with regards to the improvement of this study, it is recommended that it should be focus to wider target location such as district area, region or even possibility throughout this country. The more the population of the study, the better will be the distribution of level of hygienic practices among the food handlers in this country. Besides that, an input of attitudes and knowledge shall be put together with practices to assess each of those food handlers. Apart from assessing knowledge, attitudes and practices on hand hygiene, there were also some hygienic aspects can be considered such as food hygiene, food safety, sanitation, personal hygiene, and others.

In addition to that, this study indicates significant correlation between food handler's knowledge on personal hygiene and knowledge on cross-contamination. This significant understanding between personal hygiene and cross-contamination can be further studied to more detailed studies pertaining to the correlation between the personal hygiene and faecal contamination among food handlers. The possible cross-contamination in food can be focusing on the microbiological assessment of foods sold in school canteens, the concentration assessment of fecal coliforms, *E.coli* and *Staphylococcus aureus* can be conducted in food handler's hands, fingertips, and nose in order to assess their personal hygiene, and microbiological assessment on work surfaces and utensils used in the school canteens.

LIST OF REFERENCES

Abdul-Mutalib, N. A., Abdul-Rashid, M. F., Mustafa, S., Amin-Nordin, S., Hamat, R. A., & Osman, M. (2012). Knowledge, attitude and practices regarding food hygiene and sanitation of food handlers in Kuala Pilah, Malaysia. *Food Control*, 27(2), 289-293.

Adolf, J. N. P., & Azis, B.S. (2012). Microbiological status of various foods served in elementary school based on social economic status differences in Karawaci Region, Tangerang District-Indonesia. *International Food Research Journal*, 19(1), 65-70.

Ansari-Lari, M., Soodbakhsh, S., & Lakzadeh, L. (2010). Knowledge, attitudes and practices of workers on food hygienic practices in meat processing plants in Fars, Iran. *Food Control*, 21(3), 260-263.

Aruoma, O. I. (2006). The impact of food regulation on the food supply chain. Toxicology, 221, 119-127.

Aycicek, H., Aydofan, H., Küçükkaraaslan, A., Baysallar, M., & Baoustaoflu, A. C. (2004). Assessment of the bacterial contamination on hands of hospital food handlers. *Food Control*, 15 (4): 253-259.

Aycicek, H., Aydogan, H., Kucukkaraaslan, A., Baysallar, M., & Basustaoglu, A. C. (2004). Assessment of the bacterial contamination on hands of hospital food handlers. *Food Control*, 15(4), 253-259.

Bas, M., Ersun, A.S., & Kivanc, G. (2006). The evaluation of food hygiene knowledge, attitudes, and practices of food handlers' in food businesses in Turkey. *Food Control*, 17(6), 317- 322.

Campos, A. K. C., Cardonha, A. M. S., Pinheiro, L. B. G., Ferreira, N. R., de Azevedo, P. R. M., & Stamford, T. L. M. (2009). Assessment of personal hygiene and practices of food handlers in municipal public schools of Natal, Brazil. *Food Control*, 20(9), 807-810.

Cunningham, A. E., Rajagopal, R., Lauer, J., & Allwood, P. (2011). Assessment of hygienic quality of surfaces in retains food service establishments based on microbial counts and real-time detection of ATP. *Journal of Food Protection*, 74, 686-690.

FDA (Food and Drug Administration). (2009). FDA report on the occurrence of foodborne illness risk factors in selected institutional foodservice, restaurant, and retail food store facility types. US: FDA National Retail Food Team.

FDA (Food and Drug Administration). (2010). FDA trend analysis report on the occurrence of foodborne illness risk factors in selected institutional foodservice, restaurant, and retail food store facility types (1998-2008). US: FDA National Retail Food Team.

Food Act 1983 [Act 281]. (2012). Food Hygiene Regulations 2009. Kuala Lumpur: International Law Book Services.

Green, L. R., Selman, C. A., Radke, V., Ripley, D., Mack, J. C., Reimann, D. W., Stigger, T., Motsinger, M. & Bushnell, L. (2006). Food worker hand washing practices: an observation study. *Journal of Food Protection*, 10, 2417-2423.

Hodate, Y. (2004). Bacterial survey of school hostel kitchens in Malaysia. Food Contaminants Series. *Food Safety and Quality Division*. Vol.4.

Jay, J.M., Loessner, M.J., & Golden, D.A. (2005). Modern Food Microbiology, Seventh ed. Springer, New York 473-495.

Judah, G., Donachie, P., Cobb, E., Schmidt, W., Holland, M. & Curtis, V. (2010). Dirty hands: bacteria of faecal origin on commuters' hands. *Epidemiology and Infection*, 138, 409-414.

Kaltenthaler, C., Elsworth, M., Schweiger, S., Mara, D. & Braunholtz, A. (1995). Faecal contamination on children's hands and environmental surfaces in primary schools in Leeds. *Epidemiology and Infection*, 115, 527-534.

Kornacki, J. L., & Johnson, J. L. (2001). *Enterobacteriaceae*, coliforms, and *Escherichia coli* as quality and safety indicators, In: Downes, F., Ito, K. (Eds), Compendium of Methods for the Microbiological Examinations of Foods, fourth ed. American Public Health Association, Washington, D.C., pp. 69-80.

Kotzekidou, P. (2013). Microbiological examination of ready-to-eat foods and ready-to-bake frozen pastries from university canteens. *International Journal of Food Microbiology*, 34, 337-343.

Kyriacou, A., Drakopoulou, S., Georgaki, I., Fountoulakis, M., Mitsou, E., Lasaridi, E., Manios, Y. & Manios, T. (2009). Screening for faecal contamination in primary schools in Crete, Greece. *Child: care, health and development*, 35(2), 159-163.

Lahou, E., Jacxsens, L., Daelman, J., Van Landeghem, F., & Uyttendaele, M. (2012). Microbiological performance of a food safety management system in a food service operation. *Journal of Food Protection*, 75(4), 706-16

Mamun, M.A., Mahfuzur Rahman, S. M., & Turin, T. C. (2013). Microbiological quality of selected street food items vended by school-based street food vendors in Dhaka, Bangladesh. *International Journal of Food Microbiology,* 166, 413-418.

Mankee, A., Ali, S., Chin, A., Indalsingh, R., Khan, R., Mohammed, F., Rahman, R., Sooknanan, S., Tota-Maharaj, R., Simeon, D., & Adesiyun, A.A. (2003). Bacteriological quality of 'doubles' sold by street vendors in Trinidad and the attitudes, knowledge and perceptions of the public about its consumption and health risk. *International Journal of Food Microbiology,* 20, 631-639.

Mazni, S., Toh, P.S., & Mohamed Azam, M. A. (2013). Hygiene practices of food handlers at Malaysian Government Institutions Training Centers. *Procedia-Social and Behavioral Sciences,* 85, 118-127.

Mead, P. S., Slutsker, L., Dietz, V., McCaig, L. F., Bresee, J. S., Shapiro, C., Griffin, P. M. & Tauxe, R. V. (1999). Food-related illness and death in the United States. *Emergence Infectious Diseases,* 5 (5): 607–625.

Michaels, B., Keller, C., Blevins, M., Paoli, G., Ruthman, T., Todd, E., & Griffith, C. J. (2004). Prevention of food worker transmission of foodborne pathogens: risk assessment and evaluation of effective hygiene intervention strategies. *Food Service Technology*, 4, 31-49.

Ministry of Health. (2012). Annual Report 2010 (pp. 385).

Payne-Palacio, J., & Theis, M. (2012). Foodservice Management Principles and Practices (12th. Ed. ed.): Prentice Hall.

Rath, C.C., & Patra, S. (2012). Bacteriological quality assessment of selected street foods and antibacterial action of essential oils against food borne pathogens. *Journal of Food Safety,* 14, 5-10.

Rodríguez, M., Valero, A., Carrasco, E., Posada, G.D., Garcia-Gimeno, R.M., Zurera, G. (2012). Evaluation of hygiene practices and microbiological status of ready-to-eat vegetable salads in Spanish school canteens. *Journal of Science, Food and Agriculture, 92*, 2332-2340.

Rodriguez, M., Valero, A., G. D. Posada-Izquierdo, Carrasco, E., & Zurera, G. (2011). Evaluation of food handler practices and microbiological status of ready-to-eat

foods in long term care facilities in the Andalusia Region of Spain. *Journal of Food Protection,* 74(9), 1504-1512.

Serraino, A., Veronese, G., Alonso, S., Matera, R., Lugoboni, B., & Giacometti, F. (2010). Bactericidal activity of electrolyzed oxidizing water on food processing surfaces. Ital. *Journal of Food Science*, 2(22), 222-228.

Subramanian, S. V., & Kawachi, I. (2004). Income Inequality and Health: What Have We Learned So Far? *Epidemiological Reviews,* Vol. 26, 78-91.

Tan, S. L., Bakar, F. A., Abdul-Karim, M. S., Lee, H. Y. & Mahyudin, N. A. (2013). Hand hygiene knowledge, attitudes and practices among food handlers at primary schools in Hulu Langat district, Selangor (Malaysia). *Food control*, 34, 428-435.

Tan, S. L., Cheng, P. L., Soon, H. K., Ghazali, H., Mahyudin, N. A., (2013). A qualitative study on personal hygiene knowledge and practices among food handlers at selected primary schools in Klang valley area, Selangor, Malaysia. *International Food Research Journal,* 20(1), 71-76.

Toh, P. S., & Birchenough, A. (2000). Food safety knowledge and attitudes: culture and environment impact on hawkers in Malaysia. Knowledge and attitudes are key attributes of concern in hawker foodhandling practices and outbreaks of food poisoning and their prevention. *Food control*, 11(6), 447-452.

APPENDIX A

(Gantt Chart)

GANTT CHART

Project Activities	September 2013	October 2013	November 2013	December 2013	January 2014	February 2014	March 2014	April 2014	May 2014	June 2014
Determine Research/Title										
Proposal Writing										
Proposal Submission										
Proposal Presentation										
Order for Equipment & Materials										
Data Collection										
Data Analysis										
Thesis Writing										
Thesis Submission & VIVA										

APPENDIX B

(Questionnaire of Study)

JABATAN KESIHATAN PERSEKITARAN DAN PEKERJAAN

FAKULTI PERUBATAN DAN SAINS KESIHATAN

UNIVERSITI PUTRA MALAYSIA

SCREENING FOR HYGIENE PRACTICES AMONG FOOD HANDLERS IN SCHOOLS IN SETAPAK, WILAYAH PERSEKUTUAN KUALA LUMPUR

SARINGAN PENCEMARAN FEKAL DI KALANGAN PENGENDALI MAKANAN DI SEKOLAH-SEKOLAH SETAPAK, WILAYAH PERSEKUTUAN KUALA LUMPUR

2013/2014

AIM: The purpose of this questionnaire is to assess the hand practices and knowledge among food handlers in selected school canteens in Setapak, Wilayah Persekutuan Kuala Lumpur.

TUJUAN: Tujuan soal selidik ini dijalankan adalah untuk menilai tahap amalan kebersihan tangan dan pengetahuan di kalangan pengendali makanan di kantin sekolah yang terpilih di Setapak, Wilayah Persekutuan Kuala Lumpur

INSTRUCTIONS: You are required to answer all the questions according to the instructions given. All information on respondents will be kept confidential and will be only used for this research project.

ARAHAN: Anda diminta untuk menjawab semua soalan yang dikemukakan mengikut arahan yang telah diberikan. Segala maklumat mengenai responden akan dirahsiakan dan hanya akan digunakan untuk kajian ini

PLEASE ANSWER THE FOLLOWING QUESTIONS BY TICKING (/) THE RELEVANT BLOCK OR WRITING DOWN YOUR ANSWER IN THE SPACE PROVIDED.

EXAMPLE of how to complete this questionnaire:

Your gender?
If you are male:

Male	/
Female	

Section A: Socio-Demographic Information

This section of the questionnaire refers to the background or biographical profile of respondents. The information will be used to compare groups of respondents. We assure you that your response will remain anonymous. Your co-operation is appreciated.

Bahagian soal selidik ini merujuk kepada latar belakang atau profil biografi responden. Maklumat tersebut akan digunakan untuk membandingkan kumpulan responden kajian. Kami memberi jaminan bahawa segala maklumat yang diisi akan dirahsiakan dari tatapan umum. Kerjasama anda amatlah dihargai.

1. Gender
Jantina

Male *Lelaki*	
Female *Perempuan*	

2. Age groups
Kumpulan umur

20-30	
31-40	
41-50	
51-60	
More than 60 years of age *Lebih dari 60 tahun*	

3. Ethnicity
Kumpulan etnik

Malays *Melayu*	
Indian *India*	
Chinese *Cina*	
Others, please specify: *Lain-lain, sila nyatakan*: _____	

4. Level of education
Tahap pendidikan

No formal education *Tiada pendidikan rasmi*	
Primary school *Sekolah rendah*	
Secondary school *Sekolah menengah*	
Diploma *Diploma*	

5. Working period (years)
Tempoh bekerja (tahun)

Less than 1 *Kurang daripada 1*	
1 - 5	
6 - 10	
11 – 15	
More than 15 *Lebih daripada 15*	

6. Income status
Status pendapatan

< RM 500	
RM 500 - RM 1000	
RM 1000 - RM 1500	
RM 1500 - RM 2000	
≥ RM 2000	

Section B: Health Information

This section of the questionnaire explores your health status regarding to previous working environment, if any, with regard to current working environment.

Bahagian soal selidik ini meneliti status kesihatan anda mengenai persekitaran kerja terdahulu, jika ada, dengan mengambil kira persekitaran kerja semasa.

7.

Are you smoking? *Adakah anda merokok?*	**Yes** **No**	

If **yes**, please state how many cigarettes do you had in one whole day? _____

8. Do you suffering from following diseases?
Adakah anda menghidap penyakit berikut?

Disease	Yes	No
a. Alzheimer		
b. Arthritis		
c. Asthma		
d. Cancer		
e. Heart Diseases		
f. Diabetes		
g. Osteoporosis		
h. Obesity		

9. Did you often experience from the following symptoms?
Adakah anda sering mengalami simptom berikut?

Symptoms	Yes	No
a. Nausea *Mual*		
b. Diarrhea *Cirit-birit*		
c. Fever *Demam*		
d. Stomach cramps *Kejang perut*		
e. Headaches *Sakit kepala*		
f. Vomiting *Muntah-muntah*		

10. Medical leave history
Sejarah cuti sakit

Medical leave	Yes	No
Have you take any medical leaves in previous week? *Adakah anda mengambil cuti sakit pada minggu yang lepas?*		
If Yes, how long do you take your medical leave and reasons of leave? _____ *Jika Ya, berapa lamakah anda mengambil cuti sakit dan sebab-sebab?*_____		

Section C: Hand Hygiene Knowledge

This section of the questionnaire explores your perception with regards to the importance of hand hygiene knowledge in preventing food contamination. *Bahagian soal selidik ini meneroka persepsi anda mengenai kepentingan pengetahuan kebersihan tangan dalam mencegah pencemaran makanan.*

No.	Statements	True	False
Personal Hygiene *Kebersihan diri peribadi*			
11.	Practicing good personal hygiene reduces the risk of food poisoning. *Mengamalkan kebersihan diri yang baik dapat mengurangkan risiko keracunan makanan.*		
12.	Accessories (jewellery, watches) should not be worn during preparation of RTE foods as it may carry different kinds of contagious bacteria. *Aksesori (barang kemas, jam tangan) tidak boleh dipakai semasa penyediaan makanan yang sedia dimakan kerana ia boleh membawa pelbagai jenis bakteria berjangkit.*		
13.	Frequent hand washing during and after food preparation is essential in minimizing the risk of food contamination. *Kekerapan membasuh tangan semasa dan selepas penyediaan makanan adalah penting dalam mengurangkan risiko pencemaran makanan.*		
14.	Human hair is the primary source of food contamination. *Rambut manusia adalah sumber utama pencemaran makanan.*		
15.	Dirty fingernails carry different kind of harmful bacteria. *Kuku yang kotor membawa pelbagai jenis bakteria berbahaya.*		
16.	Cuts on hands or fingers carry millions of harmful bacteria. *Luka pada tangan atau jari membawa berjuta-juta bakteria yang berbahaya.*		
Cross-contamination *Pencemaran silang*			
17.	Raw food contains harmful bacteria which spread rapidly to		

	anything it touches. *Makanan mentah mengandungi bakteria berbahaya yang merebak dengan cepat ke apabila tersentuh dengan barang makanan yang lain.*		
18.	Combination of RTE food and raw food can lead to cross contamination. *Gabungan makanan yang sedia dimakan dan makanan mentah boleh membawa kepada pencemaran silang.*		
19.	Wearing gloves when handling RTE foods can reduce the risk of food contamination. *Memakai sarung tangan ketika mengendalikan makanan yang sedia dimakan boleh mengurangkan risiko pencemaran makanan.*		
20.	Wearing a clean apron reduces the risk of food contamination *Memakai apron yang bersih mengurangkan risiko pencemaran makanan.*		
21.	Wearing caps or hair net can reduces the risk of food contamination *Memakai topi atau jarring rambut boleh mengurangkan risiko pencemaran makanan*		
22.	Wearing accessories (jewellery,watches) can increase the risk of food contamination *Memakai aksesori (barang kemas, jam tangan) boleh meningkatkan risiko pencemaran makanan*		
23.	Washing hands before preparing and handling RTE foods can reduces the risk of food contamination *Membasuh tangan sebelum menyediakan dan mengendalikan makanan yang sedia dimakan boleh mengurangkan risiko pencemaran makanan*		

Section D: Hand Hygiene Practices

This section of the questionnaire assesses your knowledge and attitudes on the importance of hand hygiene in preventing the occurrence of microbiological contamination among consumers (school children). *Bahagian soal selidik ini menilai pengetahuan dan sikap anda mengenai kepentingan kebersihan tangan dalam mencegah berlakunya pencemaran mikrobiologi di kalangan pengguna (kanak-kanak sekolah).*

Question 24 - 32 will be asked on your personal hygiene practice in hand washing. ***Soalan 24 - 32*** *adalah mengenai amalan kebersihan peribadi anda iaitu amalan mencuci tangan.*

	Hand wash	**Yes**	**No**
24.	Do you wash your hands after visiting restroom? *Adakah anda mencuci tangan anda selepas mengunakan tandas?*		
25.	Do you wash your hands before preparing food? *Adakah anda mencuci tangan sebelum menyediakan makanan?*		

26.	Do you wash your hands before and after preparing raw materials? *Adakah anda mencuci tangan anda sebelum dan selepas menyediakan bahan-bahan mentah?*		
27.	I do not wash my hands after sneezing/coughing/blowing nose. *Saya tidak mencuci tangan saya selepas bersin / batuk / menghembus hidung.*		
28.	Do you wash your hands after eating or drinking? *Adakah anda mencuci tangan selepas makan atau minum?*		
29.	Do you wash your hands after touching your face, hair, or clothes? *Adakah anda mencuci tangan selepas menyentuh muka anda, rambut, atau pakaian?*		
30.	I do not wash my hands after handling rubbish or other waste. *Saya tidak mencuci tangan saya selepas mengendalikan sampah sarap atau lain-lain.*		
31.	I do not wash my hands after handling between raw food and food that is ready to eat. *Saya tidak mencuci tangan saya selepas mengendalikan makanan mentah dan makanan yang sedia untuk dimakan.*		
32.	Do you wash your hands with soap before and after preparing food? *Adakah anda mencuci tangan dengan sabun sebelum dan selepas menyediakan makanan?*		

Question 33 - 39 will be asked on your personal hygiene practice in wearing gloves.
***Soalan 33 - 39** adalah mengenai amalan kebersihan peribadi anda iaitu amalan pemakaian sarung tangan.*

	Glove use	**Yes**	**No**
33.	Do you wear gloves while preparing food? *Adakah anda memakai sarung tangan semasa menyediakan makanan?*		
34.	Do you wear gloves while preparing raw materials? *Adakah anda memakai sarung tangan semasa menyediakan bahan-bahan mentah?*		
35.	Do you wear gloves when your hands have cuts? *Adakah anda memakai sarung tangan apabila tangan anda mempunyai luka?*		
36.	Do you wash your hands after changing gloves? *Adakah anda mencuci tangan anda selepas menukar sarung tangan?*		
37.	Do you change your gloves when changing type of product? Adakah anda menukar sarung tangan anda apabila menukar jenis produk?		
38.	I do not change my gloves after preparing raw materials. *Saya tidak menukar sarung tangan saya selepas*		

	menyediakan bahan-bahan mentah.		
39.	I do not change my gloves even it is damaged or dirty. *Saya tidak menukar sarung tangan saya walaupun ia sudah rosak atau kotor.*		

Thank you for completing this questionnaire. Please return it back to the researcher once it is completed. *Terima kasih kerana melengkapkan soal selidik ini. Sila kembalikan semula borang selidik ini kepada penyelidik setelah selesai menjawab.*

APPENDIX C

(Hygiene Practice Checklist)

FOOD HANDLERS HYGIENE PRACTICE CHECKLIST

Time/Date: _____ Location: _____

No	Description	Yes	No
1.	Employees wear clean and appropriate uniforms		
2.	Employees wear appropriate shoes		
3.	Employees wear clean protective garment (apron)		
4.	Employees wear caps or hair nets		
5.	Employees wear masks		
6.	Accessories (jewellery,watches) is not worn when handling food		
7.	Fingernails are short and clean		
8.	Smoking only occurs in designated areas away from food		
9.	Employees wear gloves when handling RTE food		
10.	Employees wash hands before using gloves or handling RTE foods		
11.	Employees wash hands after using gloves or handling RTE foods		
12.	Employees change gloves or wash hands between handling raw and RTE		
13.	Employees wash hands after returning from the toilet		
14.	Eating, drinking, or chewing gum occur only in designated areas away from food preparation		
15.	Employees wash hands after handling waste food or rubbish		
16.	Employees with infections are restricted or excluded		
17.	Employees wash hands after nose-wiping or starching body parts		

Comment: _____
_____
_____
_____

APPENDIX D

(Information Sheet of respondent)

FORM B1: RESPONDENT'S INFORMATION SHEET AND CONSENT

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

1. STUDY TITLE

Screening for hygiene practices among food handlers in schools in Setapak, Wilayah Persekutuan Kuala Lumpur

2. INTRODUCTION

Foodborne illnesses have caused a major morbidity and mortality around the world. With Malaysia's population of 28.34 million in 2010, expectations and demand by health community is on the rise (Ministry of Health, 2012). In 2012, food poisoning was the most critical factor in food and water-borne diseases which contributed to more than 56 incident rates per 100,000 populations in Malaysia.

Even though food-borne contaminants are a concern for all ages, school children are of the greatest concern where they are disproportionately impacted because they are still developing and have greater intake of foods and fluids relative to their bodyweight. In children up to 5 years of age, diarrhea is one of the most important and unacceptable public health problems that we are confronted with and food plays a major role in the epidemiology of this and other diseases (Motarjemi et al., 1993).

In Malaysia, the incidence of food poisoning has gradually increased over the years and about 65.9% of food poisoning cases occur in primary and secondary schools (Ministry of Health, 2003). A bacterial survey conducted as a collaborative project between Malaysia and Japan from May (2002) to April (2003), a total of 84 out of 1447 school hostels throughout Malaysia showed high levels of microbiological contamination in Ready-to-Eat (RTE) food samples, drinks, cooking utensils, cutlery and the environment (Hodate, 2004). Significant sources of this contaminations majorly from personal hygiene practices among food handlers.

Hence, the purpose of this study is intended to assess the hygienic practices among food handlers in primary and secondary schools in Setapak, Wilayah Persekutuan Kuala Lumpur, considering food handler's hands hygiene and glove usage practices as well as to investigate the possible causal relationship. In addition, it is also conducted to explore the association of selected socio-demographic variables of food handlers with the knowledge and practices of food handlers on hand hygiene in selected school canteens in Setapak, Wilayah Persekutuan Kuala Lumpur.

3. WHAT WILL YOU HAVE TO DO?

This study will be conducted at selected primary and secondary school canteens in Kuala Lumpur area. The population of this study will be among the food handlers who work at respective selected primary and secondary school canteens in Kuala Lumpur, Malaysia. Prior to the interview, the respondents will be given a full clarification about the study and consent form to be filled by them. There will be no biological samples will be taken among the respondents in this study.

4. WHO SHOULD NOT PARTICIPATE IN THE STUDY?

For this study, those who are not considered as food handlers will be excluded in this study. Apart from that, those who are having mental illnesses and other related illnesses are also will be excluded in this study.

5. WHAT WILL BE BENEFITS OF THE STUDY

a) TO YOU AS THE SUBJECT?

As for the subject of the study, they will be aware with the important of hand hygiene practices and knowledge in preventing microbiological contaminations in foods. Apart from that, they will be also benefits from extra knowledge in maintaining correct ways in terms of preparation and handling of food items in future. Besides that, it will also benefits the Governmental and Non-Governmental sector in terms of important of implementing food safety and food hygiene guidelines to educate the food handlers in our country.

b) TO THE INVESTIGATOR?

The main benefits of this study for the researchers will be the primary data generated from this study. The data can be used for references on screening of faecal contamination among food handlers in school canteens with an association of the level of knowledge and practices in hand hygiene.

6. WHAT ARE THE POSSIBLE RISKS?

The will be no possible risks associated with the respondents who participate in this study.

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

All the information and data collected during this study will remain confidential.

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

For enquiries, please contact:

Research contact information

Researcher : Victor anak Lantan
Contact number : 013-8296739
E-mail address : victor.lantan@yahoo.com

Research supervisor information

Research supervisor : Dr. Sarva Mangala Praveena
Contact number : 016-5169081
E-mail address : smpraveena@upm.edu.my

Research co-supervisor : Dr. Irniza Rusdi
Contact number : 012-3153360
E-mail address : irniza@upm.edu.my

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 .....
(Respondent)

Date: .....

Signature .....
(Witness)

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)

FORM B1: RESPONDENT'S INFORMATION SHEET AND CONSENT

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

1. STUDY TITLE

Screening for hygiene practices among food handlers in schools in Setapak, Wilayah Persekutuan Kuala Lumpur

2. INTRODUCTION

Foodborne illnesses have caused a major morbidity and mortality around the world. With Malaysia's population of 28.34 million in 2010, expectations and demand by health community is on the rise (Ministry of Health, 2012). In 2012, food poisoning was the most critical factor in food and water-borne diseases which contributed to more than 56 incident rates per 100,000 populations in Malaysia.

Even though food-borne contaminants are a concern for all ages, school children are of the greatest concern where they are disproportionately impacted because they are still developing and have greater intake of foods and fluids relative to their bodyweight. In children up to 5 years of age, diarrhea is one of the most important and unacceptable public health problems that we are confronted with and food plays a major role in the epidemiology of this and other diseases (Motarjemi et al., 1993).

In Malaysia, the incidence of food poisoning has gradually increased over the years and about 65.9% of food poisoning cases occur in primary and secondary schools (Ministry of Health, 2003). A bacterial survey conducted as a collaborative project between Malaysia and Japan from May (2002) to April (2003), a total of 84 out of 1447 school hostels throughout Malaysia showed high levels of microbiological contamination in Ready-to-Eat (RTE) food samples, drinks, cooking utensils, cutlery and the environment (Hodate, 2004). Significant sources of this contaminations majorly from personal hygiene practices among food handlers.

Hence, the purpose of this study is intended to assess the hygienic practices among food handlers in primary and secondary schools in Setapak, Wilayah Persekutuan Kuala Lumpur, considering food handler's hands hygiene and glove usage practices as well as to investigate the possible causal relationship. In addition, it is also conducted to explore the association of selected socio-demographic variables of food handlers with the knowledge and practices of food handlers on hand hygiene in selected school canteens in Setapak, Wilayah Persekutuan Kuala Lumpur.

3. WHAT WILL YOU HAVE TO DO?

This study will be conducted at selected primary and secondary school canteens in Kuala Lumpur area. The population of this study will be among the food handlers who work at respective selected primary and secondary school canteens in Kuala Lumpur, Malaysia. Prior to the interview, the respondents will be given a full clarification about the study and consent form to be filled by them. There will be no biological samples will be taken among the respondents in this study.

4. WHO SHOULD NOT PARTICIPATE IN THE STUDY?

For this study, those who are not considered as food handlers will be excluded in this study. Apart from that, those who are having mental illnesses and other related illnesses are also will be excluded in this study.

5. WHAT WILL BE BENEFITS OF THE STUDY

a) TO YOU AS THE SUBJECT?

As for the subject of the study, they will be aware with the important of hand hygiene practices and knowledge in preventing microbiological contaminations in foods. Apart from that, they will be also benefits from extra knowledge in maintaining correct ways in terms of preparation and handling of food items in future. Besides that, it will also benefits the Governmental and Non-Governmental sector in terms of important of implementing food safety and food hygiene guidelines to educate the food handlers in our country.

b) TO THE INVESTIGATOR?

The main benefits of this study for the researchers will be the primary data generated from this study. The data can be used for references on screening of faecal contamination among food handlers in school canteens with an association of the level of knowledge and practices in hand hygiene.

6. WHAT ARE THE POSSIBLE RISKS?

The will be no possible risks associated with the respondents who participate in this study.

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

All the information and data collected during this study will remain confidential.

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

For enquiries, please contact:

Research contact information

Researcher : Victor anak Lantan
Contact number : 013-8296739
E-mail address : victor.lantan@yahoo.com

Research supervisor information

Research supervisor : Dr. Sarva Mangala Praveena
Contact number : 016-5169081
E-mail address : smpraveena@upm.edu.my

Research co-supervisor : Dr. Irniza Rusdi
Contact number : 012-3153360
E-mail address : irniza@upm.edu.my

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 .....
(Respondent)

Date: .....

Signature .....
(Witness)

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 E

(Consent form for respondent)

JAWATANKUASA ETIKA UNIVERSITI UNTUK
PENYELIDIKAN MELIBATKAN MANUSIA (JKEUPM)
UNIVERSITI PUTRA MALAYSIA, 43400 UPM
SERDANG, SELANGOR, MALAYSIA

RESPONDENT CONSENT FORM

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 .....
(Respondent)

Signature .....
(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)