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LEVEL OF KNOWLEDGE AND PRACTICE OF DEEP FRIED FOOD CONSUMERS IN KAJANG REGARDING THE USAGE OF REPEATEDLY HEATED COOKING OIL

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BY

UMMI AQILAH ABD AZIZ

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ABSTRACT

LEVEL OF KNOWLEDGE AND PRACTICE OF DEEP FRIED FOOD CONSUMERS IN KAJANG REGARDING THE USAGE OF REPEATEDLY HEATED COOKING OIL

UMMI AQILAH ABD AZIZ

Introduction: Currently, the consumers in Malaysia prefer to consume fried foods due to their tastes, appearances, texture, easy availability and low cost. Repeatedly heated cooking oil was regularly used and practiced in food preparation among Malaysian to cut cost and save their money. This cooking method may generate the oil that is more prone to lipid peroxidation product ion which is able to bring harm to human health. The consumption of repeatedly heated cooking oil might increase the risk of developing cancer, atherosclerosis and influence the body's ability to absorb vitamins. **Objectives:** Therefore, it is interesting to measure the level of knowledge and practice of deep-fried food consumers regarding the usage of repeatedly heated cooking oil as well as to determine association the level of knowledge and practice with socio demographic information. **Methodology:** This cross-sectional study involved convenience sampling of 121 respondents at 8 night market in Kajang and Bandar Baru Bangi on February 2019. A questionnaire was used to obtain information from respondents by face-to-face interview. The data obtained were socio demographic information, knowledge and practice on usage of repeatedly heated cooking oil and knowledge of peroxide. The scores were calculated based on the correct answer for knowledge and practice. All data were analysed using SPSS version 22. **Result:** Majority of respondents had high (60%) level of knowledge regarding this issue. Most respondents (88%) did not agree that usage of repeatedly heated cooking oil is a good practice. Despite that, majority of respondents had only medium (44%) level of practice regarding the usage of repeatedly heated cooking oil. Most respondents (70%) admitted that they used cooking oil repeatedly. There was a positive but weak significant correlation between practice and age ($r = 0.195$, $p=0.032$). There was also significant relationship between levels of knowledge with their practice ($r=0.187$, $p=0.04$). Meanwhile, there was a significant association between practice and gender which showed more female have good practice compared to male ($x2=10.937$, $p=0.004$). For further analysis, there was significant regression between genders with the level of practice. **Conclusion:** Eventhough, the level of knowledge was high, most of the respondent did not apply their knowledge towards good practice of repeatedly heated cooking oil usage. Therefore, the awareness regarding the usage of repeatedly heated cooking oil need to be increased. More public education campaign regarding this unhealthy practice should be plan and implemented, which might help to improve the health status of the general population.

Keyword: Night market, Repeatedly Heated Cooking Oil, Consumers, Knowledge and Practice

ABSTRAK

TAHAP PENGETAHUAN DAN AMALAN PENGGUNA MAKANAN BERGORENG DI KAJANG TERHADAP MINYAK MASAK YANG DIPANASKAN BERULANG KALI

UMMI AQILAH ABD AZIZ

Pendahuluan: Pada masa kini, pengguna di Malaysia lebih suka mengambil makanan bergoreng kerana rasa, tekstur, mudah didapati dan murah. Minyak goreng yang dipanaskan secara berulang kali sering digunakan dalam penyediaan makanan di Malaysia untuk mengurangkan kos. Kaedah ini menyebabkan minyak masak cenderung menghasilkan produk peroksida lipid yang boleh mendatangkan kemudaratan kepada kesihatan manusia seperti kanser, *atherosclerosis* dan mempengaruhi kemampuan tubuh untuk menyerap vitamin. **Objektif:** Justeru itu, kajian ini dijalankan untuk mengukur tahap pengetahuan dan amalan pengguna mengenai penggunaan minyak masak berulang kali dipanaskan serta mengaitkan tahap pengetahuan dan amalan dengan maklumat sosio-demografi. **Metodologi:** Kajian keratan rentas ini melibatkan persampelan mudah terhadap 121 responden di 8 pasar malam di Kajang dan Bandar Baru Bangi pada bulan Februari 2019. Soal selidik telah digunakan untuk mengumpul data daripada responden melalui temu bual bersemuka. Data yang diperolehi adalah maklumat sosio-demografi, pengetahuan dan amalan mengenai penggunaan minyak masak berulang kali dipanaskan dan pengetahuan peroksida. Jumlah skor dikira berdasarkan jawapan yang betul. Semua data dianalisis dengan menggunakan SPSS versi 22. **Keputusan:** Hasil kajian menunjukan, majoriti responden mempunyai tahap pengetahuan yang tinggi (60%) mengenai isu ini. Kebanyakan responden (88%) tidak bersetuju bahawa penggunaan minyak masak berulang kali dipanaskan adalah amalan yang baik. Namun begitu, majoriti responden hanya mempunyai tahap amalan yang serdahana (44%) mengenai penggunaan minyak goreng yang berulang kali. Kebanyakan responden (70%) mengakui bahawa mereka menggunakan minyak masak berulang kali. Terdapat hubungan yang signifikan positif tetapi lemah antara amalan dan umur ($r= 0.195$, $p=0.032$). Terdapat juga hubungan yang signifikan antara tahap pengetahuan dengan amalan mereka ($r=0.187$, $p=0.04$). Sementara itu, terdapat hubungan yang signifikan antara amalan dan jantina dimana ramai perempuan mempunyai tahap amalan yang bagus berbanding lelaki ($x2=10.937$, $p=0.004$). Analisis seterusnya menunjukkan regresi signifikan antara jantina dengan tahap amalan. **Kesimpulan:** Walaupun tahap pengetahuan mereka tinggi, sebahagian responden tidak menggunakan pengetahuan mereka terhadap penggunaan minyak masak berulang kali dipanaskan dengan baik. Justeru itu, kesedaran mengenai amalan yang tidak sihat ini perlu ditingkatkan. Kempen pendidikan awam perlu dirancangkan dan dilaksanakan supaya dapat meningkatkan status kesihatan penduduk.

Kata Kunci: Pasar Malam, Minyak Masak Dipanaskan Berulang Kali, Pengguna, Pengetahuan dan Amalan

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LIST OF ABBREVATIONS

AOCS	American Oil Chemists' Society
DNA	Deoxyribonucleic Acid
FFA	Free Fatty Acid
IV	Iodine Value
KAP	Knowledge, Attitude and Practice
meqO/kg	Milliequivalents of oxygen per kilogram
MPKj	Kajang Municipal Council
MUFA	Monounsaturated Fatty Acid
PUFA	Polyunsaturated Fatty Acid
PV	Peroxide Value
SV	Saponification Value

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CHAPTER 1

INTRODUCTION

1.1 Background

Globalisation has caused changes in people's life styles in food consumption habits. In developing countries, the consumers do not have time for cooking at home, the changes in consumption habits of the society, cultural interactions, fast living, and the contribution of women to work life are influencing and changing the nutrition style. Nowadays, people prefer to buy food sold on the streets to meet their alternatives sources of nutrition. Street foods are being prepared and sold at the street and other open public spaces like schools, train stations, bus terminals, entertainment and festival areas where people are crowded. These foods are ready to consume without the need for any processing or preparation (Sezgin and Sanher, 2016). The street foods are common consuming by consumers is fried foods.

Currently, the consumers in Malaysia prefer to consume fried foods because of their tastes, appearances, texture, easy availability and low cost. Many people attend night market solely to consume fried foods such as salty snack and pastries, as well as coffee, soda and others cost-effective products that can be eaten quickly. Deep-frying is common process that used for frying fried foods. Deep-frying is definite as a frying process of immersing food in hot oil at temperature typically between 160°c-190°c in the presence of air and moisture (Azman et al., 2012). The process of deep-frying food is generally produces desirable or undesirable flavour compounds, changes the flavour

stability and quality, colour and texture of fried foods and detrimental to its nutritional value (Choe and Min, 2007).

Deep-frying and the use of repeatedly heated cooking oil for frying is usually practiced in commercial and sometimes in domestics cooking process to cut their costs and save money. The oil is discarded only when it became foamy, releases bad odour and sometimes when the colours turn dark which could affect the quality of the food. The way of this cooking method may generate the oil that is more prone to lipid peroxidation product which is able to bring harms to human health (Jaarin et al., 2011). Furthermore, repeatedly heated cooking of the oil can cause it to create and release the compounds into the food may be carcinogenic, affect liver health or influence the body's ability to absorbs vitamins. Additionally, the existence of excess polar compounds in repeatedly heated cooking oil has been related with increased risk of developing hypertension (Azman at el., 2012).

According to Choe and Min (2006), the hydrolysis, oxidation, and polymerization of oil are common chemical reactions in frying oil and produce volatile and non-volatile compounds. The quality of oil deteriorates with increased the length of frying time due to the accelerated formation of oxidized and polymerized lipid species in the frying medium. The changes in physical appearance of the oil such as increased viscosity, darkening in colour, increased foaming and decrease in smoke point of the oil also due to the repeatedly heated cooking oil (Azman et al., 2012).

Large amount of peoples in Malaysia consumed of fried foods that bought from street food outlets, night market food outlets and restaurants (Azman et al., 2012). In

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Malaysia, studies done to measure the general public awareness on the dangers of consuming repeatedly heated cooking oil are lacking (Azman et al., 2015). Most studies are focusing on food outlet operators as a target groups. Therefore, the study aim to determine the level of knowledge and practices of deep-fried food consumers regarding the usage of repeatedly heated cooking oil.

1.2 Problem statement

The lack of knowledge regarding the usage of repeatedly heated cooking oil will affect the practices in food preparation among deep-fried food consumers. They do not aware about the effect of repeatedly heated cooking oil. The consumption of repeatedly heated cooking oil is may pose them to health hazards. In this process of frying food, cooking oil is often exposed to high temperatures for long periods of time. This practice generates lipid peroxidation products that may bring harms to human health (Lapointe et al., 2006). Repeatedly heated cooking oil is also related to cancer illnesses because the more frequent used of same cooking oil will produce harmful toxic substances to the body (Ahmad, 2015).

This study was focusing more on consumers because there are lacking of studies that had been done to measure the general public or consumers' awareness on the dangers of consuming repeatedly heated cooking oil. Based on the previous study, it is found that the mean of awareness score of residents in Kuala Lumpur is moderate (7.8 out of 12 points) with the majority of respondents (42%) scoring moderately in their level of knowledge and practice regarding the usage of repeatedly heated cooking

oil (Azman et al., 2015). Most of the studies had focused on food outlet operators as a target groups.

1.3 Research question

a. What is the levels of knowledge and practice of deep-fried food consumers regarding the usage of repeatedly heated cooking oil?
b. Is there any association between the levels of knowledge regarding the usage of repeatedly heated cooking oil with socio demographic factors among deep-fried food consumers in Kajang?
c. Is there any association between the levels of practice on the usage of repeatedly heated cooking oil with socio-demographic factors among deep-fried food consumers in Kajang?
d. Is there any association between the level of knowledge and practice on repeatedly heated cooking oil usage?

1.4 Research justification

Based on previous study, there was stated that the presence of toxic compounds in repeatedly heated cooking oil can cause harms to human health. Mostly it will affect the health after prolonged consumption. Most of the diseases are non-communicable diseases such as high blood pressure, vascular inflammation, increase the risk of hypertension, diabetes, contribute to atherosclerosis and potentially can cause cancer. This study was focusing to the night market food outlet in Kajang. These areas were being chosen due to they represent typical residential areas within Kajang and

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estimation of population distribution in this area is 55,399 people based on Development Planning MPKj Department (2015). Due to rapid urbanization many people do not have time to cook at home, the changes in consumption habits of the society, cultural interactions, fast living, and the contribution of women to work life are influencing and changing the nutrition style. There are a lot of people largely depend upon night market foods to meet their daily nutrition. Night markets were mostly and frequently attended by the consumers because the time of operation is after working hours. This study aims to determine the level of knowledge and practice among deep-fried food consumers regarding the usage of repeatedly heated cooking oil. In accordance with the level of knowledge and practice obtained, this study further assess the level of awareness among the respondents.

1.5 Objective

1.5.1 General objective

To determine the level of knowledge and practice of deep-fried food consumers regarding the usage of repeatedly heated cooking oil in Kajang.

1.5.2 Specific objectives

a. To describe the socio-demographic distribution of deep-fried food consumers.

b. To determine the levels of knowledge and practice of deep-fried food consumers on the usage of repeatedly heated cooking oil in Kajang.

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c. To determine the association between the socio demographic factors among deep-fried food consumers with their levels of knowledge and practice on the usage of repeatedly heated cooking oil.

d. To determine the association between the levels of knowledge with their practice on the usage of repeatedly heated cooking oil in Kajang.

1.6 Hypothesis

a. There is significant association between the socio- demographic factors among deep-fried food consumers with their level of knowledge on the usage of repeatedly heated cooking oil.

b. There is significant association between the socio-demographic factors among deep-fried food consumers with their level of practice on the usage of repeatedly heated cooking oil.

c. There is significant association between the levels of knowledge of deep-fried food consumers with their practice on the usage of repeatedly heated cooking oil.

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1.7 Definition

1.7.1 Conceptual definition

i. Night market food outlet

Night market is known as a street markets which operate at night between 6 o'clock until 10 o'clock at night.

ii. Deep-fried food

Deep-fried foods are known as a food that cooked by using oil. The common method used is deep-frying which food is submerged in hot fat (oil). Popular deep-fried foods in Malaysia include fish ball, chicken nuggets, chicken ball, crab stick, sausage fried, chicken fried and French fries.

iii. Deep-fried food consumers

Deep-fried food consumer is the person who consume or take the fried foods as an alternative nutrition.

1.7.2 Operational definition

i. Night market food outlet

This study was conducted at night market in Kajang which covered the area Bandar Baru Bangi that operate from 6 o'clock until 10 o'clock at night. There many type of goods sell especially food such as fried foods. The frying foods

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prepared by using large amount of cooking oil. They prepare continuously from 6pm until 10:30pm where it is the time for night market usually operated.

ii. Deep-fried food

A deep-fried foods which are fish ball, chicken nuggets, chicken ball, crab stick, sausage fried, chicken fried and others that were deep fried with submerged in the hot oil at temperature between 170°C-220°C.

iii. Deep-fried food consumers

This study was conducted among the deep-fried food consumers who are the citizens of Malaysia who live in the residential of Kajang, and consume deep-fried foods, belonging to either any three major ethnic groups in Malaysia (Malay, Chinese and Indian) and of both genders.

1.8 Conceptual framework

The study was focusing on the level of knowledge and practice of deep-fried food consumers regarding the usage of repeatedly heated cooking oil. Based on the framework (Figure 1.8), the use of repeatedly heated cooking oil is caused by several factors which are comes from low level of knowledge and practices amongst food outlet operators and also consumers itself.

Repeatedly heating cooking oil will increase the level of peroxide and aldehyde compound due to the high temperature, duration or frequency of repeated

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using the same cooking oil. Besides that, the presence of such hazardous compounds in the cooking oil is able to bring harmful effect to human health.

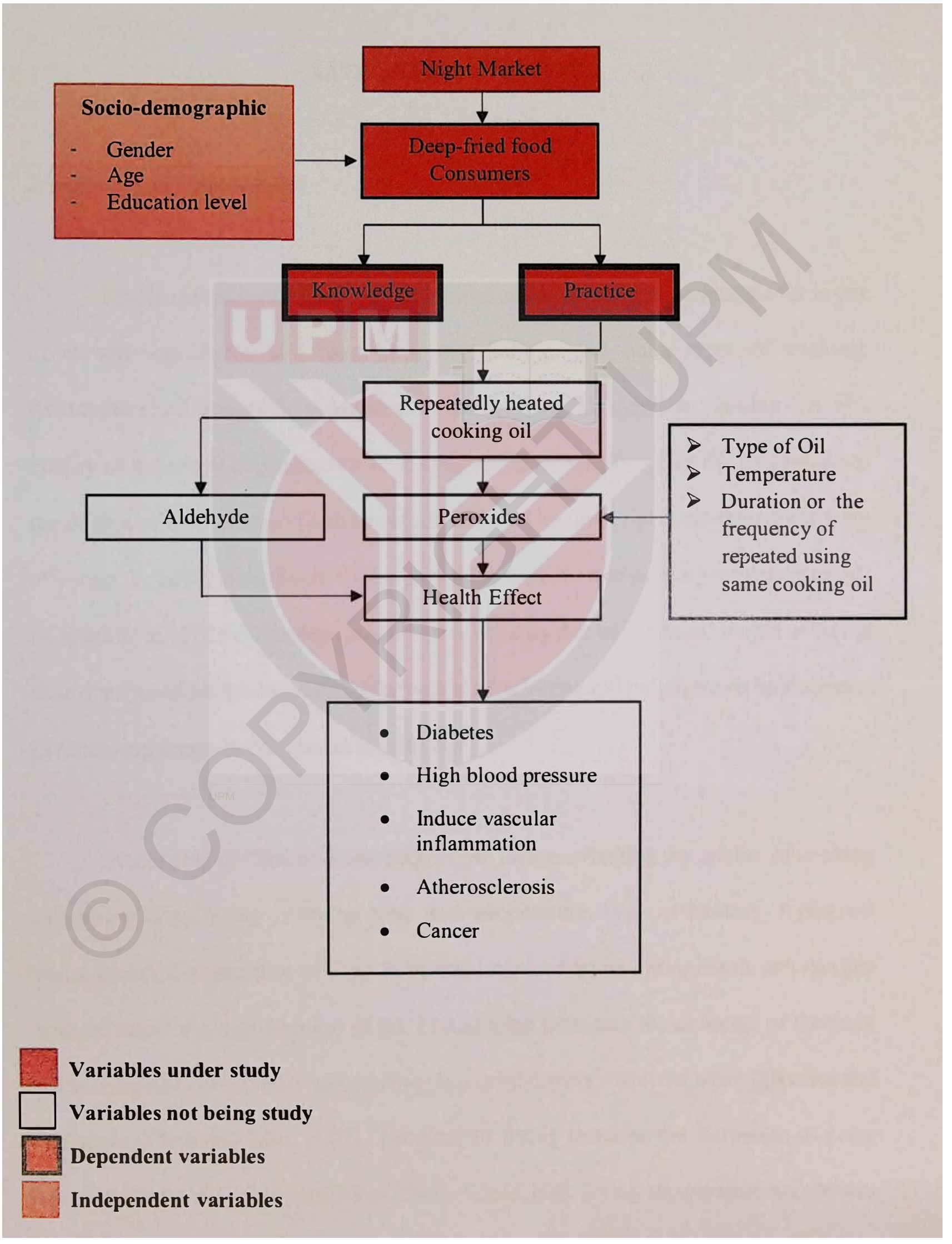

Figure 1.8: Study conceptual framework

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CHAPTER 2

LITERATURE REVIEW

2.1 Quality of Cooking Oil

Edible oil such as cooking oil of animal and plant origin or synthetic fat is one of chosen ingredients that used in frying, baking, and other types of cooking. Researchers had studied the changes and effect of peroxide values in cooking oils. The quality of the oils is dependent on their chemical compositions, like the percentage of the degree of unsaturation (Kaleem et al., 2015). The time, light and temperature are effecting the peroxide value (PV) that measures the extent of primary oxidation of oils (Kaleem et al., 2015). The deterioration of oil quality due to increased length of frying time that can cause the accelerated formation of oxidized and polymerized lipid species in the frying medium (Azman et al., 2012).

According to Choe and Min (2007), the factors affecting the quality of cooking oil during deep-frying is frying time and temperature, type of heating, frying oil composition, composition of food to be fried, type of fryer, antioxidants and oxygen content affect the deterioration of oil. Frying time increases the contents of the fatty acids and polar compounds such as triacylglycerol dimers, oxidized triacylglycerol and polymers (Choe and Min, 2007). The first 20 frying increase the formation of polar compounds rapidly (Choe and Min, 2007). While, high frying temperature accelerates

thermal oxidation and polymerization of oils. Choe and Min (2007) reported that the naturally present or added antioxidants in oils influence oil quality during deep-frying. Nitrogen or carbon dioxide reddening decreased the dissolved oxygen in oil and reduced the oxidation of oil during deep-frying (Przybylski and Eskin, 1988).

In the continuous frying process, it is produced steam that covers the surface of the oil. It is important due to prevent the oil become contact with atmospheric oxygen (Corsini and Jorge, 2009). Atmospheric oxygen reacts instantly with lipid and other organic compounds of the oil which decreased the quality of food and gives effect to human health. Moreover, fried foods discharge water, the longer the usage of oil in frying the greater is the possibility of hydrolytic degradation (Freire et al., 2013).

The consumption of repeatedly heated cooking oil is unhealthy. The oil must discarded if the physico-chemical properties of cooking oil worse because it can prove to be unsafe for human consumption (Azman et al., 2012). Iodine value (IV), saponification value (SV), viscosity, density, and peroxide value (PV) are the physicochemical parameters that used to examine the compositional quality of oils. Anwar et al. (2003) clarified that rancidity of food items can yields of auto and photo-oxidation, which are natural oxidation and chemical degradation processes of edible oils, where fatty acids esters of oils are converted into free fatty acid (FFA). Oils with high degree of unsaturation are highly susceptible to autoxidation and determination of the peroxide value (PV) is the best test for autoxidation (oxidative rancidity) (Kaleem et al., 2015).

2.2 Palm Oils

According to Basiron (2007), Malaysia is currently the world's largest producer and exporter of palm oil. Therefore, most of Malaysian are likely to use cooking oil from palm oil. The fact that palm oil is cheaper and widely available in Malaysia. Palm oil is obtained from the fruit of the palm tree. It is contains high amounts of beta-carotene since the palm is reddish in colour. Besides that it is also contains high of saturated fat and semisolid forms at room temperature. Based on Kamisah et al., (2005) they said that palm oil is rich in tocopherols and contains an abundant amount of tocotrienols. The palm oil has low proportion of polyunsaturated fatty acid compared to the soy oil. The major fatty acids form in palm oil are monounsaturated and saturated (Kamisah et al., 2005).

Based on previous study, palm oils are known to support the growth of fungi and bacteria especially when it contain moisture (Kaleem et al., 2015). Lipolytic enzymes of oils are active and produce free fatty acids (2%) under unfavourable conditions. Some microorganisms are survive in oil by producing the lipase. Based on Okechalu et al., (2011) stated that, the fungi produces the spores make them survive in anaerobic conditions of the oil due to their spores are resistant to heat. Like the fungi *Aspergillus flavus* is important because of its ability to produce aflatoxin that sometimes induce toxic syndromes such as cancer (Kaleem et al., 2015). Palm oil is shown to have antioxidant, anticancer, and cholesterol lowering effects. It is resistant to oxidation when heated compared to other types of cooking oil. Despite, when a cooking oil is repeatedly heated, it may be forms toxic degradation products, such as

aldehyde that may be can absorbed into our systemic circulation when consumes it (Shuid et al., 2007).

2.3 Production of Hazardous Compound

There are many types of chemical reaction occurs during deep such as the hydrolysis, oxidation and polymerization of oil. According to Choe and Min (2007), the amount of free fatty acid, mono- and diacylglycerols in oils increases during hydrolysis of oil. The moisture forms steam which evaporates with a bubbling action and slowly subsides as the food is fried in heated oil. As a simple explanation of chemical reaction occurs, water is a weak nucleophile, attacks the ester linkage of tryglycerols and produces di- and mono-acylglycerols, glycerol and free fatty acids. Based on previous study, the large amount of water can hydrolyse the oil rapidly. Water hydrolyses the oil faster than steam (Dona et al, 2003). Free fatty acids and their oxidised product compounds produce off-flavour and make the oil less acceptable for deep-frying.

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According to Choe and Min (2007), they stated that oxidation of oil occurs at greater rate compared to hydrolysis during deep-frying. The oxygen in deep frying reacts with oil. The radical oxygen needs radical oil for the oxidation of oil. There are many hazardous compound produces during oxidation such as hydro peroxides, aldehydes, ketones, carboxylic acids, and short chain alkanes and alkenes. Besides that, radical and Diels-Alder reaction during deep frying are also produces dimers and

polymers in oil. Heat, light, metals, and reactive oxygen species are factors that facilitate the radical formation in oil.

Peroxide value is an important indicator of rancidity in foods (Guzman et al., 2011). The peroxide value could increase corresponds with the storage time, contact with air of oil samples and temperature (Zahir et al., 2014). It is found that heating of the oil causes the increase of the index of peroxide at the beginning of cooking to a maximum value and then there is a decrease (Kaleem et al., 2015). Hydro peroxides is the unsaturated fatty acids that formed by lipid oxidation are very unstable and breakdown into a wide variety of volatile flavour compounds as well as non-volatile compounds. Therefore, the increasing of PV showed that the concentration of hydro peroxides is higher at beginning, while, the PV decreased when the secondary products are observed (Kaleem et al., 2015). However peroxides are also rapidly decomposed at high temperature.

2.4 Health Effects

As a result of repeated heating during the frying process, fried foods contain a considerable amount of oxidized oil holding hazardous reactive oxygen as explained above. As stated by Chong and Teng (2017), long-term intake of repeatedly heated cooking oil can be harmful to human health, predominantly by weakening the human antioxidant defence system, and leading to many chronic diseases such as hypertension, diabetes, vascular inflammation and coronary heart diseases (CHD).

Based on a study by Goswami et al.,(2015), when people always consume oxidised oil, their bodies are constantly exposed to a significant level of oxidative stress, resulting from an imbalance between an oxidative defence system and the formation of oxidising substances, containing free radicals. This situation is like exposing ourselves to toxic substances without any protection, and can cause oxidative damage to biomolecules such as DNA, carbohydrates, proteins and lipids in our body and finally leading to many chronic diseases including atherosclerosis, cancer, diabetes, rheumatoid arthritis, stroke, aging and other degenerative diseases (Uttara et al., 2009).

Furthermore, PV is quite high in repeatedly heated oils and may be related with the significant increase in plasma lipid peroxidation. This is supported by previous study, showed that consumption of repeatedly heated cooking oil might cause an increase in lipid peroxidation and LDL in ovariectomized female rats which stimulates a post-menopausal state with oestrogen deficiency in humans (Siti et al., 2009). The result of that particular study therefore proposed that repeated heating gradually reduced the protective effect of cooking oil and may contribute to pathogenesis of atherosclerosis in post-menopausal women (Siti et al., 2009). Another recent study in animal which is rat, showed that consumption of repeatedly heated cooking oil may result in increased blood pressure and necrosis of cardiac tissues (Azman et al., 2015).

In addition, Azmil Haizam et al., (2016) reported that a reduction in serum and hepatic vitamin E content was observed in rats that were fed with a food containing repeatedly heated cooking oil. It is bring negative consequences to liver health. Thus,

when a combination of repeatedly heated soybean and rapeseed oils feed to the rats, they showed hepatic damage with a significant elevation of the marker enzymes for liver function (Azmil Haizam et al., 2016).

2.5 Knowledge, Attitude and Practice (KAP) Theory

According to Badran (1995), definition of knowledge is the acquisition, retention and use of information or skills. Knowledge is a process of understanding and distinguished from the experience of feeling. Knowledge is attained from both education and experience. For instant, the knowledge owned by consumers refers to their understanding on adverse effect regarding the usage of repeatedly heated cooking oil and the good practice is needed to prevent such adverse effect: atherosclerosis, cancers, diabetes and other degenerative disease.

Meanwhile, attitude is defined as an expressed by evaluating a particular entity with some degree of favour or disfavour. Based on Eagly and Chaiken (2007), they stated that attitude has three components: cognition, affect, and behaviour. Cognition consists of true and false beliefs about the problem. Health education may change such beliefs. For example, cancer patients may have beliefs that they may not live healthy or long lives due to the having heard that they will dying from any complications of cancers. Hence, they assume that the same fate might happen to them (Marathe et al., 2016) and this attitude does not change their practice towards the usage of repeatedly heated cooking oil.

According to Marathe et al., (2016), practice is defined as the attainment of knowledge which is enhanced understanding of problem or disease. Any modification in attitude caused by the removal of misunderstandings about problems or diseases that transforms into preventive behaviours. Therefore, such statements may reflect the interrelationship between knowledge and attitude. Practice is behaviour or actions that can prevent the disease from spreading. In this cases, the consumers must take a good practice on usage of repeatedly heated cooking oil to prevent the disease become worse.

Based on previous study, KAP survey methodology supposed that knowledge and attitude are related and affect the preventive practice. According to figure 2.5, it shows that the KAP-O model of behavioural change (Wan, 2014). Health education interventions can improve knowledge and attitude which is can enhances towards good practice. Therefore, the knowledge-attitude-practice are associate to one another that can leads to improved outcomes.

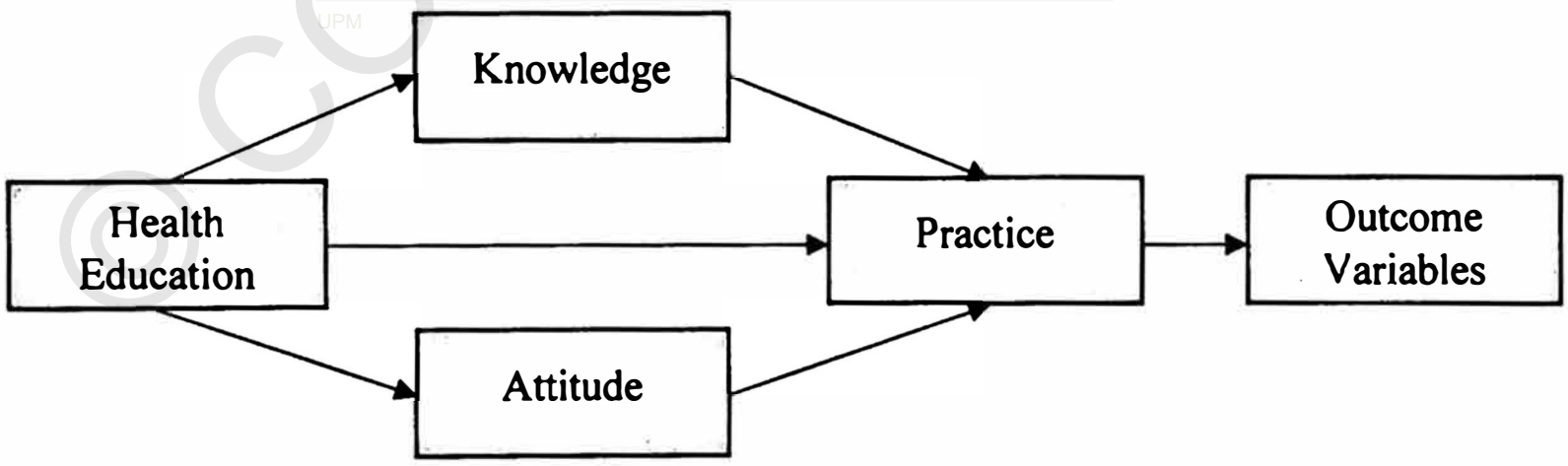

Figure 2.5: Relationships of KAP-O Components in Health Education Research

2.6 Awareness of Using Repeatedly Heated Cooking Oil

There are a few studies conducted knowledge, attitude and practice regarding the usage of repeatedly heated cooking oil in Malaysia. Based on Azman et al., (2015) survey conducted in Kuala Lumpur, majority of the respondents using the repeatedly heated cooking oil. The level of awareness regarding the usage of repeatedly heated cooking oil among the public in Kuala Lumpur is influenced by socioeconomic status. The result shows that, respondents with higher income and education level had higher level of awareness.

According to the study was conducted by Sivananthan et al., (2013), the findings showed that the level of knowledge, attitude and practice of respondents in Raub, Pahang need to be improved. Most of the consumers are unaware of the danger of using cooking oil repeatedly. Only a small portion of consumers who are aware of this issues. This small portion need to be changed to a bigger of consumers are well aware of this issues. In order to achieves this kind of result, campaigns are needed to create awareness on the usage of repeatedly heated cooking oil can cause harm to health.

Based on a study conducted at Bukit Mertajam, Penang, the result revealed that majority of respondents had moderate awareness and practice level on the usage of repeatedly heated cooking oil. Most of respondents claimed that they had used the cooking oil twice or even up to the fourth times. This practice was not bad because the peroxide values (PV) begin to exceed the AOCS standard limit of 10 meqO/kg

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following the 5th cycle of frying. From this study, they recommended that relevant actions need to be taken by governments or food authorities to address the issue and ensure safe consumption of fried foods by consumers (Adriana et al., 2018).

Besides that, based on a study at India, consumption of fried foods from road side stalls, food outlets in market and restaurants is quite common. Their food intake patterns are determined by socioeconomic status. For instant, people who from low income group tend to get their nutrition in road side stalls. It has been reported in a survey, about 48% of people consumed fried food 1-6 times per week (Chakraborty et al., 2009). Thus, socioeconomic status is one of the factors associated the practice on the usage of repeatedly heated cooking oil.

Last but not least, according to Phiri, Mumba and Mangwera (2006) clarified that, about 91% of the respondents had not been educated on food quality and safety issues in a Japanese survey. Public awareness regarding the toxic of using repeatedly heated cooking oil is still not satisfactory in developing and under-developed countries. They stated that about 60% of people have claimed still utilizing the same part of repeatedly heated cooking oil.

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CHAPTER 3

METHODOLOGY

3.1 Study Location

This study was carried out at the night markets operated in Kajang which covered the area of Bandar Baru Bangi (figure 3.1). These locations were being chosen because they represent typical residential areas within Kajang and estimation of population distribution in this area is 55,399 people based on Development Planning MPKj Department (2015).

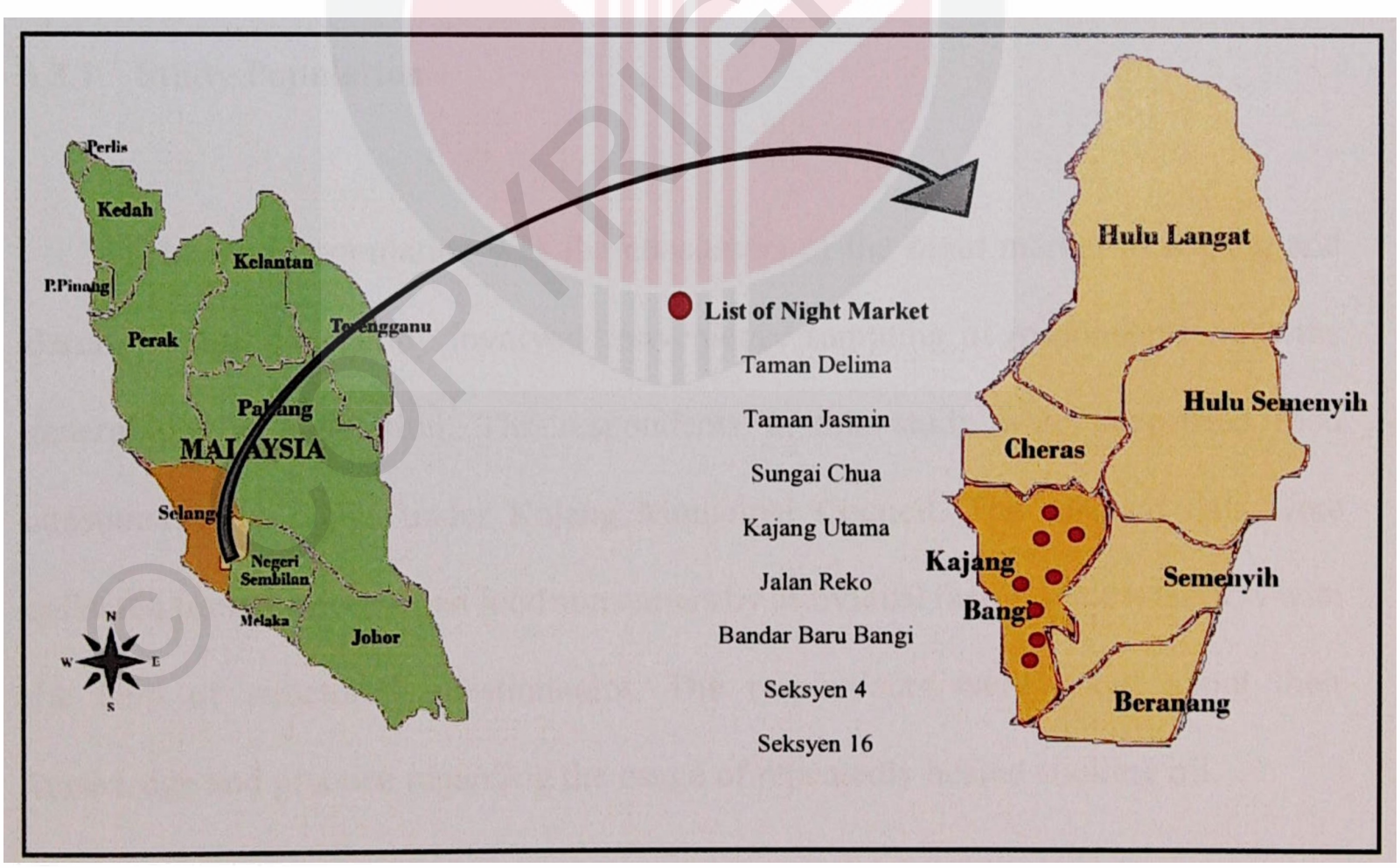

Figure 3.1: The study locations.

3.2 Study Design

This cross-sectional study involved convenience sampling. Data collection was conducted throughout February 2019 at eight selected night markets in Kajang and Bandar Baru Bangi which involved general publics that consumed deep-fried foods. These locations include areas such as Taman Delima, Taman Jasmin, Sg.Chua, Kajang Utama, Jalan Reko, Bandar Baru Bangi, Bandar Baru Bangi Seksyen 4 and Bandar Baru Bangi Seksyen 6. These locations were chosen because they represent typical residential areas within Kajang and Bandar Baru Bangi.

3.3 Study Sample

3.3.1 Study Population

The study population was the consumers of the night market in Kajang and Bandar Bangi. This study involved convenience sampling of respondents from the general public population. The respondents in this study were deep-fried food consumers who's live under Kajang Municipal Council. The relevant data were collected from the deep-fried food consumers by individual face-to-face interview with the help of structured questionnaire. The respondents were asked about their knowledge and practice regarding the usage of repeatedly heated cooking oil.

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The inclusion criteria were citizens of Malaysia who are residents of Kajang, aged 18 and above, belong to either any three major ethnic groups in Malaysia (Malay, Chinese and Indian) and of both genders. The respondents also must had experience in using and handling cooking oil for frying. There were no exclusion criteria.

3.3.2 Sampling Frame

The information used to identify the study population was determined. Different approaches were performed by the researcher in order to recruit the study population based on the inclusion and exclusive criteria as discussed in Section 3.3.1.

A verbal permission was obtained from Kajang Municipal Council, Selangor. The list of night markets was obtained from the Kajang Municipal Council as shown in Appendix D1. Night markets were sorted based on their locations which were located in Kajang and Bandar Baru Bangi. Deep-fried food consumers from the particular night market were approached.

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3.4 Sample Size

The sample size calculation was based on Lemeshow (1990) in cross-sectional study for one group of population. The formula and calculation as follow (*Equation 3.4.1 and 3.4.2*):

$$n = \frac{Z^2_{1-\alpha/2} P(1-P)}{d^2} \qquad \textit{Equation 3.4.1}$$

Where $Z^2_{1-\alpha/2}$ = z-score (1.96 for 95% confident interval)

P = Estimated population proportion (86.6% of respondents using cooking oil repeatedly for frying, based on previous study from Sivananthan et al., 2013)

d = Absolute precision required on either side the proportion (Margin of error is ± 5% or 0.05)

The calculation of estimated sample size:

$n = (1.96)^2 * 0.866 * (1-0.866) / (0.05)^2$

$= 3.8416 * 0.866 * 0.134 / (0.0025)$

$= 0.4458 / 0.0025$

$= 178.32$

$\approx$ 179 respondents

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Finite population correction factor:

$$n_a = \frac{n_r}{1+\frac{(n_r-1)}{N}} \qquad \textit{Equation 3.4.2}$$

Where n_a = The adjusted sample size

n_r = The original require sample size

N = Population size

$$n_a = \frac{178.32}{1+\frac{(178.32-1)}{213}}$$

$$= 97.31$$

$$\approx 98 \text{ respondents}$$

Thus, total of 98 respondents were required in this study to obtain margin of error of plus or minus 5%. However, after taking into consideration, an additional of 20% from the total respondents required to counter non-responsive case and reject questionnaire samples.

$$= (98 \times 0.2) + 98$$

$$= 19.6 + 98$$

$$= 117.6$$

$$\approx 118 \text{ respondents}$$

Therefore, the minimum sample size needed was 118 respondents to participate in this study.

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3.5 Data Collection and Instrumentation

3.5.1 Questionnaire

A structured questionnaire was used as the data collection tool to obtain information from respondents by individual face-to-face interview. The data obtained were socio-demographic information, knowledge and practice on the usage of repeatedly heated cooking oil, and knowledge of peroxide. This data information was used to determine the level of knowledge and practice among deep-fried foods consumers regarding the usage of repeatedly heated cooking oil.

The questionnaires were reviewed by pre-tested on the 10% of sample size which involved 12 respondents from the general public that consumes deep-fried food before the official survey was performed. Questionnaire was adopted and modified from Azman et al., 2015 and Adriana et al., 2018. As shown in Appendix C, the questionnaire was prepared in English and Malay, as pre-test prior to actual data collection among the study respondents. The survey was carried out in February 2019. Willing participants of this survey were subjected to face-to-face interview in order to get them to answer the questions in the questionnaires. The questions were divided into 4 parts as below:

a) **Part A: Socio-demographic Information.**

The respondents were required to provide the demographic data such as gender, age, sex, educational level, monthly income, occupation and type of cooking oil use. Descriptive statistics, including frequencies and percentages were calculated for each item of socio-demographic data obtained.

b) **Part B: Knowledge of repeatedly heated cooking oil.**

In order to evaluate the level of knowledge each respondent was asked eight (8) questions about the knowledge on the usage of repeatedly heated deep-fry cooking oil as shown in Appendix C. The description of the frequency and percentage of respondents answered agree, disagree and not sure to each question was shown in Table 4.2. A score 1 was given if they answered a question correctly, otherwise nil (0) mark was given. However, for Question no.8 (Will repeatedly heated cooking oil used for frying cause bad effect to our health?), if the respondents had chosen "No" or "Not Sure" as the answer, they did not have to attempt the last question (Question no.9). The scores obtained from questions were summed up and classified into three levels of knowledge (high, moderate & low) according to the total scores obtained as shown in Table 3.6.1.

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c) **Part C: Knowledge of peroxide value in repeatedly heated cooking oil.**

The respondents also were asked about the knowledge regarding the peroxide value in repeatedly heated deep-fry cooking oil. There was no scores obtained from this questions. However, descriptive statistics including frequencies and percentages were calculated.

d) **Part D: Practice regarding the usage of repeatedly heated cooking oil.**

Meanwhile, in this part the question was designated to evaluate the practice of respondents on the usage of repeatedly heated deep-fry cooking oil where the respondents were asked about the number of time they use the same cooking oil before discarding it and the ways in which they try to maintain the quality cooking oil as shown in Appendix C. The description of the frequency and percentage of respondents answered "No" and "Yes" to each question was shown in Table 4.3. A score 1 was given if they answered a question correctly, otherwise nil (0) mark was given. The scores obtained from questions were summed up and classified into three levels of practice (good, medium & poor) according to the total scores obtained as shown in Table 3.6.1.

Table 3.6.1: The scoring range for knowledge and practice.

Category	Level	Range
Knowledge	Low	0-2
	Moderate	3-5
	High	6-8
Practice	Poor	0-2
	Medium	3-4
	Good	5-6

3.6 Data Analysis

After completed the data collection, the data were analysed by using the Statistical Package for Socio Sciences (SPSS) for Windows, version 22. Descriptive statistics, including frequencies and percentages were calculated for each item in part A of the questionnaire. Statistical tests were performed including the Chi-Square test and Spearman-Rho's correlation test to determine (1) the association between the socio demographic factors with the levels of knowledge and practice on using repeatedly heated cooking oil (2) the association between the knowledge levels of respondents with their practice on using repeatedly heated cooking oil. For further analysis, the multi linear regression test was used to determine the most factors that influence the levels of knowledge and practice.

3.7 Ethical Approval

This study was obtained ethical approval from the Ethics Committee of Universiti Putra Malaysia (Ref no: UPM/TNCPI/RMC/1.4.18.2 (JKEUPM)) as shown in Appendix A. Written consent was obtained from the respondents prior to the data collection and the instruction about questionnaire was explained to the respondents during filling up the questionnaire. All information obtained from the respondents were kept private and confidential and used for study purposes only.

CHAPTER 4

RESULT

4.1 Socio-demographic information of respondents among deep-fried food consumers in Kajang, Selangor.

In total, 121 of respondents from the general public in the area of Kajang, Selangor participated in the survey. The median and IQR were used as a data was not normally distributed. This study basically surveyed on the knowledge and practice of repeatedly heated cooking oil among respondents. The respondents were dominated by female (60%) than male (40%). The respondents were aged between 18 to 61 years old, with the median age being 24 years old. More than half (n=91) of the respondents were aged between 18-35 years old if compared with age 36 and above (n=30). The majority of the population were single (70%), while others were married (30%). The respondents were dominated by Malay (96%) and followed by Chinese (2%) and Indian (2%). This situations was not surprising since that the night markets selected in Kajang has been the residential of Malay's area. The majority of respondent's educational level was up to tertiary education level (67%). Most of the respondents claimed that they were students. Over half (65%) of respondents have a monthly income of less than RM 1000. An overwhelming majority of respondents claimed to use palm oil for frying food (93%). Other details of the socio demographic data are shown in Table 4.1.

Table 4.1: Demographic data of respondents. (n=121)

Data	n(%)	Min-Max	Median[a]	IQR (25^{th} – 75^{th})
Gender:				
Male	49 (40.5)			
Female	72 (59.5)			
Race:				
Malay	116 (95.9)			
Chinese	2 (2.5)			
Indian	3 (1.7)			
Age (years old):				
18-35	91 (75.2)	18-61	24	23-35
≥ 36	30 (29.8)			
Marital status:				
Single	85 (70.2)			
Married	36 (29.8)			
Educational level:				
Secondary	40 (33.1)			
Tertiary	81 (66.9)			
Monthly income (RM):				
< 1000	79 (65.3)	0-20 000	0	0-1600
≥ 1000	42 (34.7)			
Type of oil used for frying at home:				
Palm oil	112 (92.6)			
Peanut oil	2 (2.5)			
Corn oil	16 (13.2)			
Olive oil	13 (10.7)			
Soy oil	1 (0.8)			
Coconut oil	2 (1.7)			

[a]The data is not normally distributed

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4.2 Respondents' knowledge on the usage of repeatedly heated cooking oil.

Based on the Table 4.2, the frequency and percentage of knowledge were obtained. Most of the respondents (88%) did not agree that the usage of repeatedly heated cooking oil for frying food is a good practice. Meanwhile, slightly more than half of the respondents (53%) claimed that this practice can cut the cost. However, most of the respondents (83%) disagreed that the quality of cooking oil remains the same regardless of how many times it has been reused for frying. About 57% of respondents did not agree that cooking oil can be used many times and only be discarded when it turns dark. Over half (69%) of respondents agreed that there will be loss of nutrients in repeatedly heated cooking oil. Only 19% of respondents agreed that the type of cooking oil utilized does not influence the type of by-product produced from the repeatedly heated cooking oil. The majority (81%) of respondents agreed that the usage of repeatedly heated cooking oil can cause bad effects for health. 62% said that such practice can lead to the formation of cancer. Other details about the knowledge of the respondents on the usage of repeatedly heated cooking oil are shown in Table 4.2.

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Table 4.2: The frequency and percentage of respondents' knowledge regarding the usage of repeatedly heated cooking oil.

Questions	n(%)
1. Usage of repeatedly heated cooking oil for frying food is a good practice.	
Agree	9 (7.4)
Disagree	102 (88.4)
Not sure	5 (4.1)
2. Usage of repeatedly heated cooking oil for frying food is good for saving cost.	
Agree	64 (52.9)
Disagree	49 (40.5)
Not sure	8 (6.6)
3. Usage of repeatedly heated cooking oil for frying food has no side effect.	
Agree	14 (11.6)
Disagree	90 (74.4)
Not sure	17 (14.0)
4. The quality of oil used for frying will remain the same regardless of how many times the oil is reheated.	
Agree	10 (8.3)
Disagree	100 (82.6)
Not sure	11 (10.1)
5. We can use the oil for many times and discard it only when it turns darks.	
Agree	41 (33.9)
Disagree	69 (57.0)
Not sure	11 (9.1)
6. There will be loss in nutrient in the repeatedly heated cooking oil used for frying.	
Agree	84 (69.4)
Disagree	14 (11.6)
Not sure	23 (19.0)
7. The type of cooking oil does not influence the type of constituents produced from the repeatedly heated cooking oil.	
Agree	23 (19.0)
Disagree	69 (57.0)
Not sure	29 (24.0)
8. Will repeatedly heated cooking oil used for frying cause bad effects to our health?	
Yes	98 (81.0)
No	4 (3.3)
Not sure	19 (15.7)

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9. For the 98 respondents who answered "Yes" to above question (question no.8), what type of disease do they associate with the consumption of repeatedly heated cooking oil?	
Gout	11 (11.2)
Tuberculosis	21 (21.4)
Diabetes	9 (9.2)
Hypertension	42 (42.9)
Cancer	61 (62.2)

In addition, the respondents also asked about the peroxide value in the repeatedly heated cooking oil in part C of question. Based on Figure 4.2, the result shows that more than half (58%) of the respondents have no knowledge about peroxide value contain in repeatedly heated cooking oil. However, about 42% of respondents who have the knowledge about the peroxide value in repeatedly heated cooking, obtained information regarding this issues from the internet.

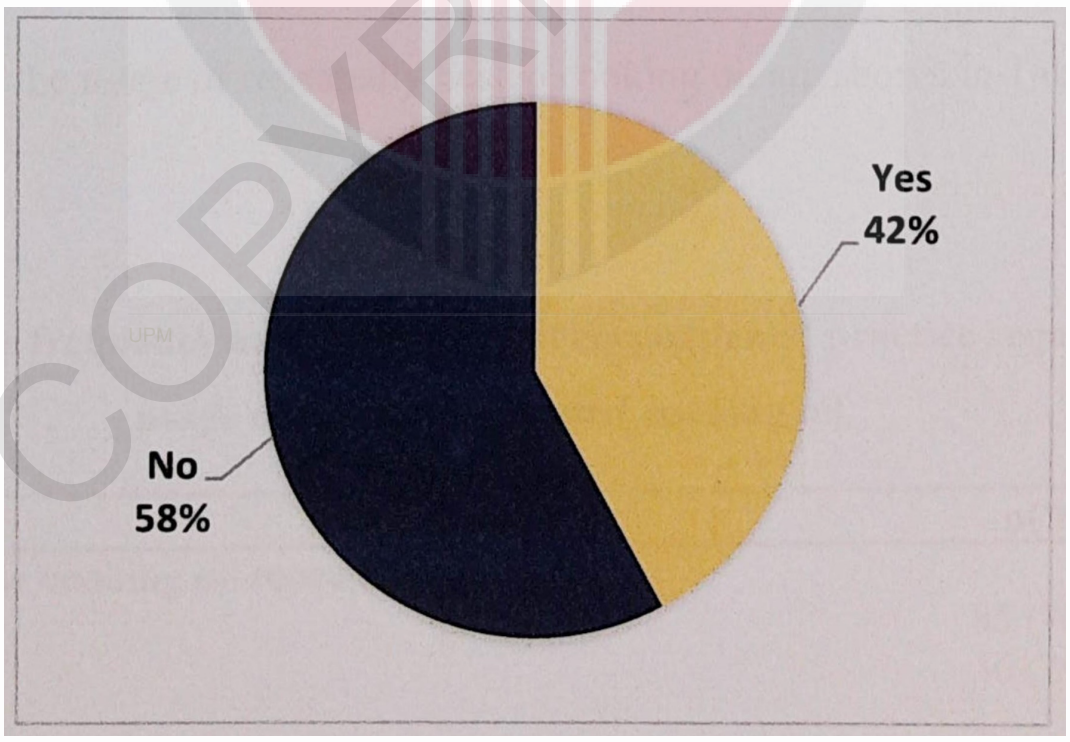

Figure 4.2: Respondents' knowledge about peroxide value in repeatedly heated cooking oil. (n=121)

4.3 Respondents' practice regarding the usage of repeatedly heated cooking oil.

Table 4.3 shows that the practice of respondents regarding the usage of repeatedly heated cooking oil. About 70% of respondents admitted that they used cooking oil repeatedly for frying. For those who did not use cooking oil repeatedly for frying, the majority (72%) stated that such practice is harmful to health. For those who used cooking oil repeatedly for frying, about 47% of respondents claimed that they never use the oil more than twice, whereas only 14% reuse cooking oil four times and more. There were several methods that practiced by respondents to maintain the quality of cooking oil, the most popular being using fresh oil for frying every time (85%). About half (50%) of respondents had no prior knowledge about this issue, but about 33% used an internet as the main source of information obtained regarding issue of using repeatedly heated cooking oil. Other details about the practice of the respondents on the usage of repeatedly heated cooking oil are shown in Table 4.3.

Table 4.3: The frequency and percentage of respondents' practice regarding the usage of repeatedly heated cooking oil.

Questions	n(%)
1. Do you use cooking oil repeatedly for frying?	
Yes	85 (70.2)
No	36 (29.8)
2. For the 36 respondents who answered "No" to the above question (question no.1), what are the reason for not using repeatedly heated cooking oil for frying?	
Harmful to health	26 (72.2)
Food will look bad	13 (36.1)
Increase cooking oil's cholesterol level	10 (27.8)

3. For the 85 respondents who used the same cooking oil for frying, how many times is the cooking oil reused before discarded?	
2 times	40 (47.1)
3 times	33 (38.8)
4-10 times	12 (14.1)
4. Methods to maintain the quality of cooking oil.	
a. Using fresh oil for frying every time	
Yes	103 (85.1)
No	18 (14.9)
b. Maintaining a small flame while frying	
Yes	53 (43.8)
No	68 (56.2)
c. Using stainless steel frying utensil	
Yes	79 (65.3)
No	42 (34.7)
d. Storing oil in stainless steel or glass container after usage	
Yes	84 (69.4)
No	37 (30.6)
e. Filtering the oil to catch any food excess or foreign matter.	
Yes	93 (76.9)
No	28 (23.1)
f. Source where information was obtained regarding the usage of repeatedly heated cooking oil.	
Newspaper	11 (9.1)
Magazine	2 (1.7)
Television	10 (8.3)
Radio	1 (0.8)
Internet	40 (33.1)
Family/friends	19 (15.7)
No prior knowledge about this issue	60 (49.6)

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4.4 Level of knowledge and practice regarding the usage of repeatedly heated cooking oil.

After scoring was done according to the procedure described in the materials and methods section, the level of knowledge and practice regarding the usage of repeatedly heated cooking oil were presented in Table 4.4, where it can be seen that majority of respondents (60%) had high level of knowledge on this issue. Meanwhile, most of respondents had only medium (44%) level of practice regarding the usage of repeatedly heated cooking oil. The knowledge scores showed that over half of respondents scored either 6 or 7 out of 8, with the median knowledge scores being 6 out of 8. The practice scores of respondents, where the majority of respondents scored 3, 4 or 5 out of 6. The median practices scores is 4 out of 6. Other details about the level of knowledge and practice regarding the usage of repeatedly heated cooking oil were shown in Table 4.4.

Table 4.4: Distribution of respondents' knowledge and practice scores regarding the usage of repeatedly heated cooking oil. (n=121)

Variables	n(%)	Min-Max	Median[a]	IQR (25^{th} – 75^{th})
Knowledge:				
Low	5 (4.1)	0-8	6	4-7
Moderate	44 (36.4)			
High	72 (59.5)			
Practice:				
Poor	25 (20.7)	1-6	4	3-5
Medium	53 (43.8)			
Good	43 (35.5)			

[a]The data is not normally distributed

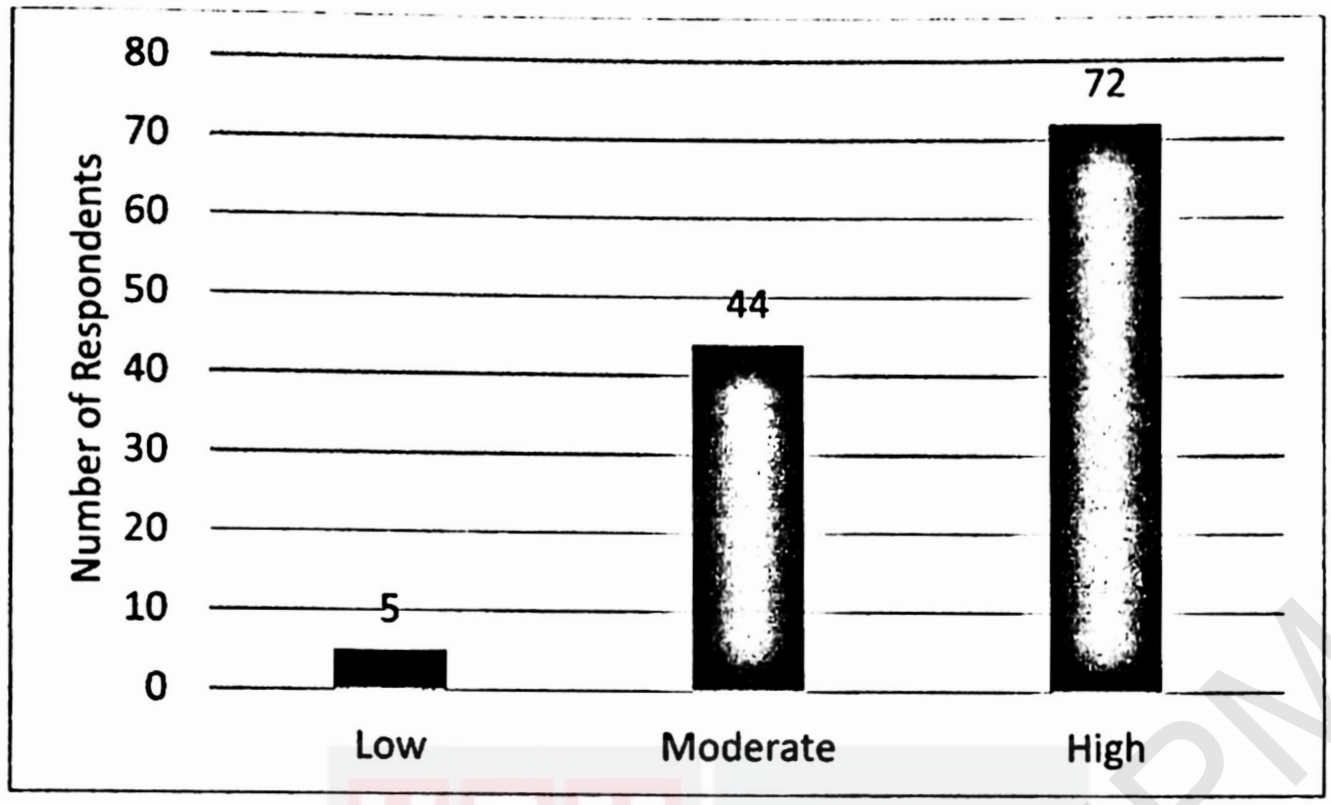

Figure 4.4.1: Knowledge scores of respondents. (n=121)

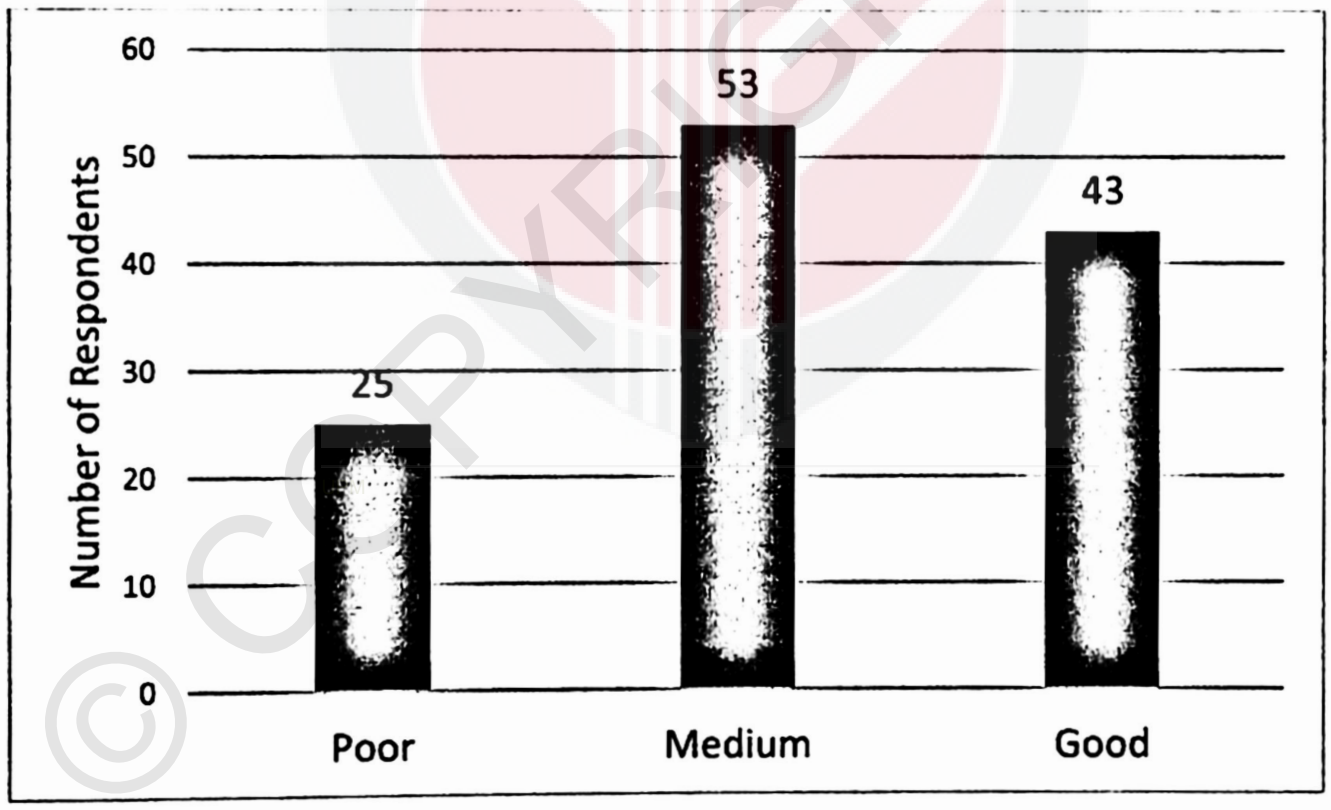

Figure 4.4.2: Practice scores of respondents. (n=121)

4.5 Factors influencing level of knowledge and practice regarding the usage of repeatedly heated cooking oil.

The Chi-square analysis was used to evaluate the association between the socio-demographic factors among deep-fried food consumers with their level of knowledge and practice on the usage of repeatedly heated cooking oil. Due to small number of respondents who responded in low/moderate categories in knowledge, these two categories were merged as one category low to moderate to obtain better meaningful result in further statistical analysis for association. Based on Table 4.5.1, there was no significant association between socio demographic (genders, age, education level and monthly income) of respondents with their level of knowledge. In the other hand, this study shows that there was significant association between genders and their practice regarding the usage of repeatedly heated cooking oil whereas female respondents had a good practice (n=34) on the usage of repeatedly heated cooking oil compared to the male (n=9) ($\chi 2$=10.937, p=0.004).

Besides that, Table 4.5.2 shows that there was also a positive but weak significant correlation between practice and age (r= 0.195, p=0.032). Thus, age was a factor that contributing to their practice. Lastly, there was also significant relationship between levels of knowledge with their practice on the using of repeatedly heated cooking oil. Based on Table 4.5.3, it was a positive but weak significant correlation between the levels of knowledge and practice (r=0.187, p=0.04).

Table 4.5.1: The association between socio demographic factors with the level of knowledge and practice. (n=121)

Variables	Level of Knowledge		Total	χ^2	p-value	Level of practice			Total	χ^2	p-value
	<Moderate	High				Poor	Medium	Good			
Gender:											
Male	22 (44.9)	27 (55.1)	49 (100)	0.662	0.416	14 (28.6)	26 (53.0)	9 (18.4)	49 (100)	10.937	0.004**
Female	27 (37.5)	45 (62.5)	72 (100)			11 (15.3)	27 (37.5)	34 (47.2)	72 (100)		
Age (years old):											
18-35	39 (42.9)	52 (57.1)	91 (100)	0.849	0.357	22 (24.2)	41 (45.0)	28 (30.8)	91 (100)	4.674	0.097
≥ 36	10 (33.3)	20 (66.7)	30 (100)			3 (10.0)	12 (40.0)	15 (50.0)	30 (100)		
Education Level:											
Secondary	18 (45.0)	22 (55.0)	40 (100)	0.503	0.478	6 (15.0)	14 (35.0)	20 (50.0)	40 (100)	5.501	0.064
Tertiary	31 (38.3)	50 (61.7)	81 (100)			19 (23.5)	39 (48.1)	23 (28.4)	81 (100)		
Monthly income (RM):											
<1000	31 (39.2)	48 (60.8)	79 (100)	0.149	0.700	19 (24.1)	33 (41.7)	27 (34.2)	79 (100)	1.598	0.450
≥1000	18 (42.9)	24 (57.1)	42 (100)			6 (14.3)	20 (47.6)	16 (38.1)	42 (100)		

χ^2 =Chi-square value

***significant value at p<0.01*

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Table 4.5.2: The relationship between socio demographic factors with knowledge and practice of respondents. (n=121)

Variables	Knowledge		Practice	
	r	p	r	p
Age	0.145	0.113	0.195	0.032*
Monthly income	0.024	0.792	0.138	0.132

r= Spearman Correlation, p= significant value

**significant value at p< 0.05*

Table 4.5.3: The relationship between the levels of knowledge with practice of respondents. (n=121)

Variables	Practice	
	r	p
Knowledge	0.187	0.04*

r= Spearman Correlation, p=significant value

**significant value at p < 0.05*

In this analysis, multiple linear regression were used to determine the selected variables that influenced the level of practice regarding the usage of repeatedly heated cooking oil among deep-fried food consumers. Based on Table 4.5.4, there was significant regression between genders with the level of practice. The results showed that, the practice level for female is increase by 0.731 (p=0.005). This analysis contributed to 10.4% of variation for the practice level of respondents in this study.

Table 4.5.4: Factors associated with practice on using repeatedly heated cooking oil. (n=121)

Variables	MLR[a]				
	β[b]	S.E	95% CI	t	p-value
Constant	1.291	0.618	0.067;2.515	2.089	0.039
Age	0.017	0.013	-0.010;0.043	1.235	0.219
Gender	0.731	0.253	0.229;1.233	2.885	0.005**

[a]Multiple Linear Regression *(Enter)* [b]Multiple regression (Adj.R^2 = 0.104)

***significant at p<0.01*

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CHAPTER 5

DISCUSSION

5.1 Socio-demographic information of respondents among deep-fried food consumers in Kajang, Selangor.

This study was conducted to assess the level of knowledge and practice regarding the usage of repeatedly heated cooking oil amongst the sub-urban population of Kajang, Selangor who consume the deep fried foods. This population was interesting to study because they lived in city which experiencing development and modernization. According to Azman et al., (2015), they assumed that the sub-urban population is more aware and knowledgeable about the health issues compared to a rural population. Therefore, the level of awareness of Kajang sub-urban population regarding this little-known health issue can be seen as being representative of the knowledge of a typical sub-urban population of a developing country in South-East Asia.

In total, 121 of respondents were surveyed. It was found that more than half of respondents were aged at ranged between 18-35 years old and most of them are single. This situation was not surprising since the age between 18-35 years old tend to go to night market compared to elderly citizens. Most of Malaysian population that went to

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night market was Malays, followed by ethnic Chinese and Indian. The majority of respondents had at least a secondary education.

In addition, all of the respondents (100%) surveyed in this study used palm oil for frying. This is not surprising since Malaysia is currently the world's largest producer and exporter of palm oil (Basiron, 2007). In fact, the palm oil is cheaper and widely available in Malaysia also helps making it a popular choice of cooking oil. Therefore, most of Malaysian tend to use palm oil as their cooking oil for frying. Other type of cooking oil such as corn, olive, soy and peanut oil are not popular amongst our respondents. Based on our survey, most of the respondents that used such types of cooking oil were those who earned monthly income of more than RM 4000 and this might probably be due to the fact that these oils are more expensive compared to the palm oils. However, this was different with finding from a study done in Goiania, Brazil where soybean oil is the major source of cooking oil for frying. This is due to Brazil has a large supply of soybean oil.

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5.2 Respondents' knowledge of the usage of repeatedly heated cooking oil.

Based on the result, a large proportion of the respondents were knowledgeable on that the consumption of repeatedly heated cooking oil is not a good practice. They admitted that long term consumption of repeatedly heated cooking oil can bring harmful effect to human health such as cancer. Unfortunately, they were still used the same cooking oil for several time before discarding. According to Sivananthan et al., (2013), repeatedly usage of the same frying oil becoming a common used and practiced in food preparation which is mainly intended to cut cost and save money. If the practice of using oil repeatedly for frying is vital due to economic reasons, then palm oil would be the better choice. As mentioned before, palm oil is cheaper compared to other types of cooking oil.

In additional, palm oil appears to be persistent towards heat as compared to soy oil in terms of repeatedly heated. Previous studies suggested that composition of palm oil is unique allowing withstand heat better than soy oil. Firstly, the palm oil has low proportion of polyunsaturated fatty acid (PUFA) compared to the soy oil but the majority fatty acids form in palm oil are monounsaturated (MUFA) and saturated (Kamisah et al., 2005). According to literature survey, PUFA is more easily to oxidize compared to MUFA. Moreover, the result of toxic compound produce in the repeated heating of vegetable oil that rich in PUFA tend to increase the risk of hypertension, whereas the oils that rich in MUFA such as palm oil can be resistant to oxidation and formed less degradation products when heated (Soriguer et al., 2006). Secondly, the

palm oil is also rich in tocopherols and contains an abundant amount of tocotrienols (Kamisah et al., 2005). Tocotrienols have better antioxidants capacity compared to tocopherols. Thus, this may contribute to the better resistance to oxidative changes due to repeated heating of palm oil.

Besides that, from interviewer sessions, more than half of respondents claimed that they did not know about the presence of peroxide in repeatedly heated cooking oil. Their source of information about this issues are limited and some of them have never heard about this issue at all. From Kaleem et al., (2015), they found that heating of the oil causes the increase of the index of peroxide at the beginning of cooking to a maximum value and then there is a decrease. Hydro peroxide is the unsaturated fatty acids that formed by lipid oxidation are very unstable and breakdown into a wide variety of volatile flavour compounds as well as non-volatile compounds. Furthermore, peroxide value (PV) is quite high in repeatedly heated oils and may be related with the significant increase in plasma lipid peroxidation that may contribute to pathogenesis of atherosclerosis (Azman et al., 2012).

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5.3 Respondents' practice regarding the usage of repeatedly heated cooking oil.

Majority of our respondents in the survey do reuse cooking oil for frying 2-3 times before discarding it. This is not too bad since most of them used palm oil for frying, which can withstand thermal oxidation quite well (Pandurangan et al., 2012) as mentioned in the previous paragraph. Based on previous study, the peroxide value (PV) begin to exceed the AOCS standard limit of 10 meqO/kg at 5th cycles of frying (Adriana et al., 2018). Therefore, it is still considered safe to be used for frying. Moreover, most of them made an effort thru using various methods to maintain the quality of oil used for frying. This is important because a previous study has shown that degradation due to the reuse of vegetable oil, especially sunflower is one of the risk factors for hypertension (Soriguer et al., 2003). However, some of respondents claimed that they use fresh oil for frying every time because it is good for health and to improve the food appearance. Besides use fresh oil in order to maintain the quality of oil during frying, over than half of respondents claimed that they use stainless steel frying utensils. This was a good practice, as copper observed in brass and different copper alloy utensils can catalyse the thermal oxidation (Berger, 2015). Additionally, some of respondents also maintained a small flame while frying, which became a good practice because the cooking oil could rapidly decompose at high temperatures.

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5.4 Level of knowledge and practice regarding on the usage of repeatedly heated cooking oil.

As presented in result part, most of the respondents have high level of knowledge on this issue. This was not surprising, since education level of respondents' were at least secondary and tertiary. Meanwhile, most of respondents had only median level of practice regarding the usage of repeatedly heated cooking oil. It showed that, despite they have high levels of knowledge about this issues, they did not apply their knowledge towards good practice regarding using of repeatedly heated cooking oil. According to previous study indicated that training enhances knowledge, but there was difference between knowledge, attitude and practice relationships as the knowledge alone was not enough to change practices (Park et al., 2012). As reported by Wan (2014), health education interventions can improve knowledge and attitude which is can enhances towards good practice. Therefore, the knowledge-attitude-practice are associate to one another that can leads to improved outcomes. However, many of them made an effort to keep the good quality of oil by using stainless steel frying utensils, transferring oil in stainless steel or glass container after usage and filtering the particle or foreign matters in cooking oil. This was a good practice as mentioned in previous paragraph.

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5.5 Factors influencing level of knowledge and practice regarding on the usage of repeatedly heated cooking oil.

There were two factors that influence the level of practice amongst the respondents in this study such as gender and age. This study revealed that there was significant association between genders with their practice regarding on repeatedly heated cooking oil. Female respondents had a good practice on using the repeatedly heated cooking oil compared to male. Thus, it can be concluded from this study, females were more aware on this issues. The reason might be that female do most cooking at home compared to male (Azman et al., 2015). Others than that, there was also a significant relationship between respondents' age with their practice regarding on the usage of repeatedly heated cooking oil. This was might be due to people are more experience with frying and this usually leads them to be more experience in cooking have good practices. Moreover, according to Institute of Medicine (US) Committee (1991), an aging populations were likely to be more concern on health effect compared to teenager and elderly. It was might be changes their practice on using cooking oil for frying.

This study revealed that there was significant relationship between levels of knowledge with their practice on using repeatedly heated cooking oil. This shown that those who have more knowledge would be able to have a good practice on using repeatedly heated cooking oil. Therefore we can assumed that, those who have less knowledge about this issue might be due to less interested in knowing the health effect

regarding their practice on using the same oil for frying. They did not know that, long term consumption of repeatedly heated cooking oil can be able bring harms to human health. Sometimes, they did not care about health issues when it comes to food. For them, food is priority. This statement was further supported by Azman et al., (2015) where they mentioned that those with adequate knowledge on health issues, would have good practice in the usage of repeatedly heated cooking oil because they were might be more aware of the detrimental effects of consuming repeatedly heated cooking oil. For further analysis, multiple linear regression was conducted. The factors that might more influence the level of practice was gender. The practice level for female is increase by 0.731 ($p=0.005$). This analysis contributed to 10.4% of variation for the practice level of respondents in this study. Gender was the most important factor which contributed to the practice on using of repeatedly heated cooking oil.

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CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The study was carried out to measure the level of knowledge and practice regarding the usage of repeatedly heated cooking oil among deep-fried food consumers in Kajang, Selangor. It was found that majority of respondents had high (59.5%) level of knowledge and had only median (43.8%) level of practice regarding the usage of repeatedly heated cooking oil. Furthermore, there was a significant association between practice and gender which showed more female have good practice compared to male (χ^2=10.937, p=0.004). Meanwhile, there was a positive but weak significant correlation between practice and age (r= 0.195, p=0.032). There was also significant relationship between levels of knowledge with their practice on using repeatedly heated cooking oil (r=0.187, p=0.04). Lastly, thru multiple linear regression, the factors that might more influence the level of practice was gender.

As a conclusion, even though the level of knowledge was high, most of the respondent did not apply their knowledge towards good practice of repeatedly heated cooking oil usage. Therefore, the awareness regarding the usage of repeatedly heated

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cooking oil need to be increased. More public education campaign regarding this unhealthy practice should be plan and implemented, which might help to improve the health status of the general population. This campaign should be carried out by the relevant authorities. Public must play a role on disseminating the information regarding the usage of repeated heated cooking oil in order for the public to aware regarding this issue other than any other agencies.

6.2 Recommendations

There were several limitations in this study as convenience sampling was done in order to obtain our respondents due to time and financial constraints. For further study it is recommended to focus on households as the target population since households tend to do more cooking and frying process. In addition, since we did not make home visits, we had to rely totally on the honesty of the respondents to get the answers to our questions that can lead to recall and information bias. Besides that, we suggested to conduct the similar study on households and collect the oil samples from them to measure the actual level peroxide value (PV) found in frying oils used in Malaysian home kitchens. In order to determine the oil quality used by the study sample, other methods such as viscosity and density, saponification value, iodine value and free fatty acid measurement can be carried out.

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APPENDIX A

(Ethical Approval Letter)

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ETHICS COMMITTEE FOR RESEARCH INVOLVING HUMAN SUBJECTS
(JKEUPM)
UNIVERSITI PUTRA MALAYSIA

Research title	:	**Level of Knowledge and Practice of Deep-Fried Food Consumers in Kajang and Determination of Peroxide Value in Repeatedly Heated Cooking Oil**
Study Site	:	**Kajang**
JKEUPM Ref No.	:	**JKEUPM-2018-389**
Researcher	:	**Ummi Aqilah binti Abd Aziz**
Supervisor	:	**Dr. Saliza binti Mohd Elias**

Documents received and reviewed with reference to the above study:

1. Ethics Application Form, Version 1 dated 29/10/2018
2. Respondent Information Sheet & Consent (English), Version 1 dated 29/10/2018
3. Respondent Information Sheet & Consent (Malay), Version 1 dated 29/10/2018
4. Proposal (English), Version 2 dated 14/12/2018
5. Questionnaires/ Interviews (English), Version 1 dated 29/10/2018
6. Questionnaires/ Interviews (Malay), Version 1 dated 29/10/2018
7. Curriculum Vitae of:
    a. Dr. Saliza binti Mohd Elias
    b. Dr. Mohd Redzwan bin Sabran

The University Research Ethics Committee, Universiti Putra Malaysia (JKEUPM) operates in accordance to the ICH-GCP Guidelines.

Decision by JKEUPM:

[X] Approved

[X] **Permission MUST BE OBTAINED from the respective hospitals/ institutions before conducting the research**

[ ] Disapproved

Please note that the approval is **VALID UNTIL 4 JANUARY 2020**

Researchers should comply with the following:

I. Complete a Study Final Report upon study completion (Form 3.2).

II. Ethical approval is required in the case of amendments/ changes to the study documents/ study sites/ study team.

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APPENDIX B1

(Subject Information Sheet English Version)

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

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

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

1. **STUDY TITLE :**
   Level of Knowledge and Practice of Deep-Fried Food Consumers in Kajang and Determination Of Peroxide Value in Repeatedly Heated Cooking Oil.

2. **INTRODUCTION:**
   Globalisation has caused changes in people's life styles in food consumption habits. Fried foods are widely consumed throughout the world. The consumers in Malaysia prefer to consume fried foods because of their tastes, appearances, texture, easy availability and low cost. However, repeatedly heated of cooking oil may generates lipid oxidation which can lower the nutritional value and quality of oils, together with the formation toxic compounds, off-flavours and off-odours. Besides that, the oil is more prone to lipid peroxidation product which is give harm to human health. Thus, repeatedly heated of the oil can cause it to create and release the compounds into the food which may be carcinogenic, affect liver health or influence the body's ability to absorbs vitamins.

3. **WHAT WILL YOU HAVE TO DO?**
   The respondents will be given a questionnaire to obtain the information related with the research.

4. **WHO SHOULD NOT PARTICIPATE IN THE STUDY?**
   This study does not have to be participate by respondents who does not consume deep-fried foods at night market in Kajang.

5. **WHAT WILL BE THE BENEFITS OF THE STUDY:**

   (a) TO YOU AS THE SUBJECT?

   It will help the respondents to be aware on health due consumption of repeatedly heated cooking oil and taking several measures in order to prevent from consuming food that contain high tendency of peroxide compounds.

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(b) TO THE INVESTIGATOR?

It will help the investigator to assess the awareness level based on knowledge and practices regarding the usage of repeatedly heated cooking oil among deep-fried food consumers and to suggest some measure that can improve the health status of not only deep-fried food consumers in Kajang, but also of the general population throughout Malaysia as well.

6. WHAT ARE THE POSSIBLE RISKS?

This study does not have any risk to the respondents because it is not involve any human biological samples such as blood or urine samples.

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

All the information about the respondent will be kept privacy and confidential.

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

If you have any additional questions, you may contact to Dr. Saliza Bt Mohd Elias, Supervisor of the research at 016-2213574 (e-mail: saliza_me@upm.edu.my) or Ummi Aqilah binti Abd Aziz, the researcher at 017-9340538 (e-mail: ummiaqilah.aa@gmail.com).

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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)

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APPENDIX B2

(Subject Information Sheet Malay Version)

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

BORANG 2.4: PENERANGAN DAN PERSETUJUAN RESPONDEN

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

1. TAJUK KAJIAN

Tahap Pengetahuan dan Amalan Pengguna Makanan Bergoreng di Kajang dan Penentuan Nilai Peroksida di dalam Minyak Masak yang Dipanaskan Berulang Kali.

2. PENGENALAN

Pada era glabalisasi ini, menyebabkan perubahan gaya hidup masyarakat dalam pengambilan makanan. Makan bergoreng disukai ramai di seluruh dunia.Pengguna Malaysia lebih gemar mengambil makanan bergoreng kerana rasa, tekstur, mudah disediakan dan murah. Walaubagaimanapun, minyak yang dipanaskan secara berulang kali boleh menghasilkan pengoksidaan lipid yang menyebabkan kemerosotan nilai nutrisi makanan dan kualiti minyak masak, penghasilan bahan toksik, rasa tidak enak dan juga bau busuk. Selain itu, pengoksidaan lipid boleh mendatangkan kesan bahaya terhadap kesihatan manusia. Oleh sebab itu, pengunaan minyak masak yang dipanaskan berulang kali telah menghasilkan dan melepaskan bahan toksik ke dalam makanan menyebabkan karsinogenik, masalah hati dan mempengaruhi keupayaan tubuh untuk menyerap vitamin.

3. APAKAH YANG PERLU ANDA LAKUKAN?

Reponden akan diberi soal selidik untuk mendapat maklumat tentang kajian.

4. SIAPA YANG TIDAK BOLEH MENYERTAI KAJIAN INI?

Responden yang tidak mengambil makanan bergoreng di pasar malam Kajang, tidak boleh menyertai kajian ini.

5. APAKAH FAEDAH MENYERTAI KAJIAN INI?

a) KEPADA ANDA SEBAGAI PESERTA?

Kajian ini dapat membantu responden mengetahui tentang kesan keatas kesihatan akibat penggunaan minyak masak yang dipanaskan berulang kali dan mengambil langkah untuk mengelakkan pengambilan makanan yang mengandungi sebatian peroksida yang tinggi.

b) KEPADA PENYELIDIK?

Kajian ini dapat membantu penyelidik untuk menilai tahap kesedaran berdasarkan pengetahuan dan amalan pengguna mengenai penggunaan minyak masak yang dipanaskan berulang kali dan mencadangkan beberapa langkah yang boleh meningkatkan status kesihatan bukan sahaja kepada pengguna makanan bergoreng di Kajang , tetapi juga penduduk di seluruh Malaysia.

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6. ADAKAH IA BERISIKO?

Kajian ini tidak mendatangkan risiko kepada responden kerana tidak melibatkan sebarang sampel biologi manusia seperti sampel darah atau air kencing.

7. ADAKAH MAKLUMAT DAN IDENTITI SAYA KEKAL RAHSIA?

Semua maklumat mengenai responden akan disimpan secara rahsia dan sulit.

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

Jika anda mempunyai sebarang persoalan, sila hubungi Dr. Saliza bt Mohd Elias, Penyelia Penyelidik di 016-2213574 (e-mail: saliza_me@upm.edu.my) atau Ummi Aqilah binti Abd Aziz, Penyelidik di 017-9340538 (e-mail: ummiaqilah.aa@gmail.com).

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

9. PERSETUJUAN

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

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

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

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

*potong yang tidak berkenaan

Tandatangan .....
(*Responden*)

Tarikh :.....

Tandatangan .....
(*Saksi*)

Nama :.....

No. K/P: .....

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

Tarikh .....

Tandatangan .....
(*Penyelidik*)

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APPENDIX C

(Questionnaire Form)

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DEPARTMENT OF ENVIRONMENTAL AND OCCUPATIONAL HEALTH,
FACULTY OF MEDICINE AND HEALTH SCIENCES,
UNIVERSITI PUTRA MALAYSIA, 43400 UPM
SERDANG, SELANGOR MALAYSIA

QUESTIONNAIRE / *SOAL SELIDIK*

TITLE: Level of Knowledge and Practice of Deep Fried Food Consumers in Kajang Regarding the Usage of Repeatedly Heated Cooking Oil.

TAJUK KAJIAN: Tahap Pengetahuan dan Amalan Pengguna Makanan Bergoreng di Kajang Terhadap Minyak Masak yang Dipanaskan Berulang Kali.

Introduction: This study is aim to assess the Level of Knowledge and Practice of Deep Fried Food Consumers in Kajang Regarding the Usage of Repeatedly Heated Cooking Oil. Please give accurate information as required. All information provided will be used for research purpose only. Thank you for you cooperation

Pengenalan: Kajian ini bertujuan untuk menentukan Tahap Pengetahuan dan Amalan Pengguna Makanan Bergoreng Terhadap Minyak Masak yamg Dipanaskan Berulang Kali. Sila berikan maklumat yang tepat seperti dikehendaki. Semua maklumat yang diberikan akan digunakan untuk tujuan pengajian sahaja. Terima kasih atas kerjasama anda.

Respondent ID : _____
Responden ID

Date : _____
Tarikh

Part A: Demographic information

Bahagian A: Maklumat Demografi

Instruction: Please fill in the blank and tick (/) where appropriate.

Arahan: Sila isikan tempat kosong dan tandakan (/) di mana sesuai.

1. Gender: Male / Female
   Jantina: Lelaki / Perempuan

2. Marital status: Single / Married
   Status Perkahwinan: Bujang / Berkahwin

3. Age: …….. years old
   Umur: …….. tahun

4. Race: Malay ( ) Chinese ( ) India ( ) Others: ……..
   Bangsa: Melayu ( ) Cina ( ) India ( ) lain-lain: ……

5. Education level: PMR/SRP ( ) SPM ( ) DEGREE ( ) MASTER ( ) PHD ( )
   Tahap Pendidikan: PMR/SRP ( ) SPM ( ) DEGREE ( ) MASTER ( ) PHD ( )

6. Occupation: Government servants/*Badan kerajaan* ( )
   Non-government servants/*Bukan badan kerajaan* ( )
   Self-employed/*Bekerja sendiri* ( )
   Student/*Pelajar* ( )
   Homemaker/*Suri rumah tangga* ( )
   Retired/*Pencen* ( )
   Unemployed/*Tidak bekerja* ( )

7. Income: RM……
   Jumlah pendapatan: RM……

8. Do you like to consume deep fried food? YES / NO
   Adakah anda gemar mengambil makanan bergoreng? YA / TIDAK

9. Types of oil used for frying at home
   Jenis minyak digunakan untuk menggoreng di rumah

Palm Oil Minyak kelapa sawit	☐	Peanut oil Minyak kekacang	☐	Corn oil Minyak Jagung	☐
Soy oil Minyak soya	☐	Olive oil Minyak zatun	☐	Coconut oil Minyak kelapa	☐

Others: ……
Lain-lain: ……

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Part B: Respondent's knowledge on the usage of repeatedly heated cooking oil

Bahagian B: Pengetahuan responden mengenai penggunaan minyak masak yang berulang kali dipanaskan

Instruction: Please fill in the blank and tick (/) where appropriate.

Arahan: Sila isikan tempat kosong dan tandakan (/) di mana sesuai.

1. Usage of repeatedly heated cooking oil for frying food is a good practice.
   Penggunaan minyak masak yang dipanaskan berulang kali untuk menggoreng makanan adalah amalan yang sihat.

   a. Agree *Setuju* ☐ b. Disagree *Tak setuju* ☐ c. Not sure *Tak pasti* ☐

2. Usage of repeatedly heated cooking oil for frying food is good for saving cost.
   Penggunaan minyak masak yang dipanaskan berulang kali untuk menggoreng makanan adalah bagus untuk penjimatan.

   a. Agree *Setuju* ☐ b. Disagree *Tak setuju* ☐ c. Not sure *Tak pasti* ☐

3. Usage of repeatedly heated cooking oil for frying food has no side effect.
   Penggunaan minyak masak yang dipanaskan berulang kali untuk menggoreng makanan tiada kesan sampingan.

   a. Agree *Setuju* ☐ b. Disagree *Tak setuju* ☐ c. Not sure *Tak pasti* ☐

4. The quality of oil used for frying will remain the same regardless of how many times the oil is reheated.
   Kualiti minyak yang digunakan untuk menggoreng akan tetap sama tanpa mengira berapa kali minyak dipanaskan.

   a. Agree *Setuju* ☐ b. Disagree *Tak setuju* ☐ c. Not sure *Tak pasti* ☐

5. We can use the oil for many times and discard it only when it turns darks.
   Kita boleh menggunakan minyak tersebut berulang kali dan membuangnya hanya apabila ia bertukar menjadi gelap.

   a. Agree *Setuju* ☐ b. Disagree *Tak setuju* ☐ c. Not sure *Tak pasti* ☐

6. There will be loss in nutrient in the repeatedly heated cooking oil used for frying.
Nutrisi dalam makanan akan hilang apabila minyak masak yang dipanaskan berulang kali digunakan untuk menggoreng.

a. Agree ☐ *Setuju*
b. Disagree ☐ *Tak setuju*
c. Not sure ☐ *Tak pasti*

7. The type of cooking oil does not influence the type of constituents produced from the repeatedly heated cooking oil.
Jenis minyak masak tidak mempengaruhi jenis ramuan yang dihasilkan daripada minyak masak yang dipanaskan berulang kali.

a. Agree ☐ *Setuju*
b. Disagree ☐ *Tak setuju*
c. Not sure ☐ *Tak pasti*

8. Will repeatedly heated cooking oil used for frying cause bad effects to our health?
Adakah minyak masak yang dipanaskan berulang kali untuk menggoreng akan membawa kesan buruk kepada kesihatan?

a. Yes ☐ *Ya*
b. No ☐ *Tidak*
c. Not sure ☐ *Tak pasti*

9. Who answered "Yes" for question (question no. 8), what type of disease associate with the consumption of repeatedly heated cooking oil?
Bagi yang jawab "Ya" untuk soaln (soalan no. 8), apakah jenis penyakit yang berkaitan dengan penggunaan minyak masak yang sama berulang kali dipanaskan?

Gout ☐
Gout

Tuberculosis ☐
Batuk kering

Diabetes ☐
Kencing manis

Hypertension ☐
Darah tinggi

Cancer ☐
Kanser

Others: .....
Lain-lain: .....

*respondents can choose more than one for this question.

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Part C: Respondent's knowledge about peroxide

Bahagian C: Pengetahuan responden mengenai peroksida

Instruction: Please fill in the blank and tick (/) where appropriate.

Arahan: Sila isikan tempat kosong dan tandakan (/) di mana sesuai.

1. Do you know peroxide contain in the repeated heated cooking oil?
   Adakah anda tahu dalam minyak masak yang dipanaskan berulang kali mengandungi peroksida?

   Yes ☐ No ☐
   Ya *Tidak*

2. If answer "Yes", where the source of information was obtained regarding the peroxide in the repeated heatedly cooking oil.
   Jika jawapan "Ya", dimanakah anda mendapat maklumat berkaitan peroksida yang terkandung dalam minyak masak yang berulang kali dipanaskan.

   Newspaper ☐ Magazine ☐ Television ☐
   Surat khabar *Majalah* *Televisyen*
   Radio ☐ Internet ☐ Family/friends ☐
   Radio *Internet* *Keluarga/kawan*

   Others: .....
   Lain-lain: .....

   *respondents can choose more than one for this question.
   **responden boleh memilih lebih daripada satu jawapan untuk soalan ini*

3. What happen if the peroxide values are high in the cooking oil?
   Apakah yang akan terjadi jika kadar peroksida tinggi di dalam minyak masak?

   The quality of the cooking oil is good. ☐
   Kualiti minyak masak bagus.

   The quality of the cooking oil is bad. ☐
   Kualiti minyak masak tidak bagu.

   Need to discard the oil and replace the new cooking oil. ☐
   Perlu buang dan tukarkan dengan minyak yang baru.

   The oil is still can be used. ☐
   Minyak tersebut masih boleh digunakan.

   *respondents can choose more than one for this question.

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Part D: Respondent's practice regarding the usage of repeatedly heated cooking oil

Bahagian D: Amalan mengenai penggunaan minyak masak yang berulang kali dipanaskan

Instruction: Please fill in the blank and tick (/) where appropriate.

Arahan: Sila isikan tempat kosong dan tandakan (/) di mana sesuai.

1. Do you use cooking oil repeatedly for frying?
   Adakah anda menggunakan minyak masak yang sama berulang kali untuk menggoreng?

   Yes ☐ *Ya* No ☐ *Tidak*

   If answer "Yes", skip to question 3.
   Jika jawapan "Ya", sila langkau soalan 3

2. What are the reason for not using repeatedly heated cooking oil for frying?
   Apakah sebab anda tidak menggunakan minyak masak yang berulang kali dipanaskan?

   Harmful to health ☐
   Bahaya untuk kesihatan

   Food will look bad ☐
   Makanan akan kelihatan teruk

   Increase cooking oil's cholesterol level ☐
   Boleh meningkatkan kadar kolestrol dalam minyak

   Others: .....
   Lain-lain: .....

3. How many times is the cooking oil reused before discarded?
   Berapakah kekerapan anda menggunakan minyak tersebut sebelum anda membuangnya?

   2 times ☐ *2 kali* 3 times ☐ *3 kali* 4 times ☐ *4 kali*

   5 times ☐ *5 kali* 6 times ☐ *6 kali* 7 times ☐ *7 kali*

   Others: .....
   Lain-lain: .....

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4. Choose all methods to maintain the quality of cooking oil.
Pilih kaedah-kaedah untuk mengekalkan kualiti minyak masak

a) Using fresh oil for frying every time
Sentiasa menggunakan minyak yang baru

Yes *Ya* ☐ No *Tidak* ☐

b) Maintaining a small flame while frying
Mengekalkan api yang kecil semasa menggoreng

Yes *Ya* ☐ No *Tidak* ☐

c) Using stainless steel frying utensil
Menggunakan alatan menggoreng dari jenis keluli tahan karat

Yes *Ya* ☐ No *Tidak* ☐

d) Storing oil in stainless steel or glass container after usage
Menyimpan minyak dalam bekas keluli tahan karat atau kaca selepas penggunaan

Yes *Ya* ☐ No *Tidak* ☐

e) Filtering the oil to catch any food excess or foreign matter
Penapisan minyak untuk memerangkap lebihan makanan atau bahan asing

Yes *Ya* ☐ No *Tidak* ☐

5. Where do you obtained the source of information regarding the peroxide in the repeatedly heated cooking oil?
Di manakah anda mendapat maklumat berkaitan peroksida di dalam minyak masak yang berulang kali dipanaskan?

Newspaper *Surat khabar* ☐ Magazine *Majalah* ☐ Television *Televisyen* ☐
Radio *Radio* ☐ Internet *Internet* ☐ Family/friends *Keluarga/kawan* ☐

No prior knowledge about this issue ☐
Tiada sebarang pengetahuan mengenai isu ini

Others: .....
Lain-lain: .....

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APPENDIX D1
(MPKj Letter)

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List of Night Market in Kajang and Bandar Baru Bangi

MUKIM KAJANG

Kawasan Kajang : 14

Senarai Pasar Malam

Nama Pasar	Penganjur	Hari
Taman Kajang Utama	Pengerusi Persatuan Penduduk Seksyen 1 & 2 Taman Kajang Utama, No.7, Jalan SS 1/10, Taman Kajang Utama, 43000 Kajang, Selangor. Timbalan Pengerusi Rukun Tetangga Taman Kajang Utama, No.8, Jalan Seksyen 2/10, Taman Kajang Utama, 43000 Kajang, Selangor. - En. Abu Bakar Bin Alias (016-6078532)	Ahad & Rabu
Taman Bukit Mewah	Persatuan Penjaja-Penjaja & Peniaga-Peniaga Kecil Daerah Hulu Langat No.7, Jalan Sri Saga 5, Taman Sri Saga, 43000 Kajang, Selangor. - En. Goh Kim Huei (012-2373200)	Ahad
Desa Jenaris	Persatuan Penduduk Jenaris Kajang D/A No.25, Jalan 4B, Desa Jenaris, 43000 Kajang, Selangor. - En. Mohamad Zobir Bin Hj. Kamaruddin (019-2816528) - En. Azmis (017-2875654)	Ahad
Taman Setia Sg. Chua	JKKK Kg. Baru Sg. Chua, Balai JKKK, Jalan 13, Kg. Baru Sg. Chua, 43000 Kajang, Selangor. - En. Rex Seow Zhu Xin (017-3603456)	Isnin
Hentian Kajang	Persatuan Penduduk Taman Tenaga, Kajang No.5, Jalan 10, Taman Tenaga, 43000 Kajang, Selangor. - En. Ibrahim Mohammad (019-2595191) - En. Khairulzani Abd Ghani (012-3843582)	Isnin & Jumaat
Taman Asa Jaya	Jabatan Pelesenan & Penjaja, MPKj (03-87371789 - 2014)	Rabu

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Taman Jasmin	Persatuan Penduduk Taman Jasmin D/A KAFA Integrasi Jasmin, Jalan Jasmin 24, Taman Jasmin, 43000 Kajang, Selangor. - En. Zaid Hashim (017-3556286 / 03-87393790) - En. Fairuz Shauki Bin Osman (012-4275737)	Khamis
Kg Baru Sg. Chua	Jabatan Pelesenan & Penjaja, MPKj (03-87371789 - 2014)	Khamis
Taman Sri Langat	Jabatan Pelesenan & Penjaja, MPKj (03-87371789 - 2014)	Selasa
Taman Delima	Persatuan Penduduk Taman Delima No.65, Jalan Delima 11, Taman Delima, Batu 13, Jalan Cheras, 43000 Kajang, Selangor. - En. Azman Bin Rasman (019-3699334) - En. Fauzikarimullah Bin Ahmad (AJK) - (013-3940800)	Sabtu
Sg. Jelok	Jabatan Pelesenan & Penjaja, MPKj (03-87371789 - 2014)	Jumaat
Taman Kenari, Kajang	Jabatan Pelesenan & Penjaja, MPKj (03-87371789 - 2014)	Ahad
Taman Kajang Perdana	Persatuan Penduduk Taman Kajang Perdana B-1-10 Blok B, Jalan Kajang Perdana 2, Kajang Perdana, 43000 Kajang, Selangor. - En. Azmis (017-2875654)	Selasa
Prima Saujana	Bumi Shah Enterprise No.63, Jalan Impian Setia, Saujana Impian, 43000 Kajang, Selangor. - En. Shahferi Bin Shahabudin (019-3137143 / 016-6564143)	Khamis

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Kawasan Bangi : 7

Senarai Pasar Malam

Nama Pasar	Penganjur	Hari
Seksyen 7, Bandar Baru Bangi	Persatuan Penjaja Dan Peniaga Kecil Melayu Negeri Selangor Cawangan Bandaraya Shah Alam Zon Kajang. No.55, Jalan ¼, Seksyen 1, Bandar Teknologi Kajang, 43500 Semenyih, Selangor - Dato' Che Noorzhar Bin Che Noor (016-2442630)	Khamis
Seksyen 16, Bandar Baru Bangi	Persatuan Penduduk Bandar Baru Bangi D/A Sekolah Agama LEPAI, Seksyen 16, 43650 Bandar Baru Bangi, Selangor - En. Habib (012-3656593)	Sabtu & Selasa
Seksyen 4, Bandar Baru Bangi	Persatuan Penduduk Pangsapuri Jubli Perak D/A 205 Blok 4, Jalan 4/2, Fasa 4, 43650 Bandar Baru Bangi, Selangor - En. Sharuddin Yatim (013-2660536) - En. Dollah (016-2869904)	Rabu & Jumaat
Pekan Bangi	Jawatankuasa Kemajuan Kawasan Bangi, (JKKB) Balai Komuniti, Jln 2 (PKNS), Batu 6, Bangi, 43000 Kajang, Selangor - En. Marzuki Ibrahim (012-6299055) - En. Md.Roslan Bin Ab.Manap (s/u) (019-2242854)	Khamis
Bandar Seri Putra	Pusat Penduduk Bandar Sri Putra No.15, Jalan SP 2/3H, Bandar Seri Putra - Ust. Nushi Bin Mahfodz (019-7771750) - En. Khairuzi (017–3864209)	Sabtu & Selasa
Seksyen 9, Taman Industri Kecil & Sederhana, Bandar Baru Bangi	JKKK Sg. Ramal No. 3 Lot 6074, Jln Dato' Dagang. Kg. Sg. Ramal Dalam, 43000 Kajang, Selangor - En. Suhardi (017-3545734)	Rabu
Bandar Bukit Mahkota, Bangi	Jabatan Pelesenan & Penjaja, MPKj (03-87371789 - 2014)	Jumaat

SENARAI BAZAAR MALAM : 3

Nama Pasar	Penganjur	Hari
Bazaar Malam Reko Sentral	Persatuan Penduduk Seksyen 1 Dan Seksyen 2 Taman Kajang Utama No. 7, Jalan SS 1/10, Taman Kajang Utama, 43000 Kajang Selangor - Hj.Syaiful Anuar (019-2477702) - Abd Razak Mia (017-2807610) (Jaringan Insan Berwawasan)	Selasa hingga Ahad
Bazaar Malam Taman Kajang Putra	Fortune Venture Management Sdn. Bhd. No. 14, Lorong Mas, Taman Sungai Mas, Jalan Reko, 43000 Kajang, Selangor - En. Mohd Muhaimin Bin Mhd Yussof (019-7848480)	Jumaat & Sabtu
Bazaar Malam Prima Saujana Kajang	Bumi Shah Enterprise No.63, Jalan Impian Setia, Saujana Impian, 43000 Kajang, Selangor - En.Shahferi Bin Shahabudin (019-3137143 / 016-6564143)	Jumaat hingga Ahad

List of night markets that have been selected as a study location.

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APPENDIX D2
(Onsite work picture)

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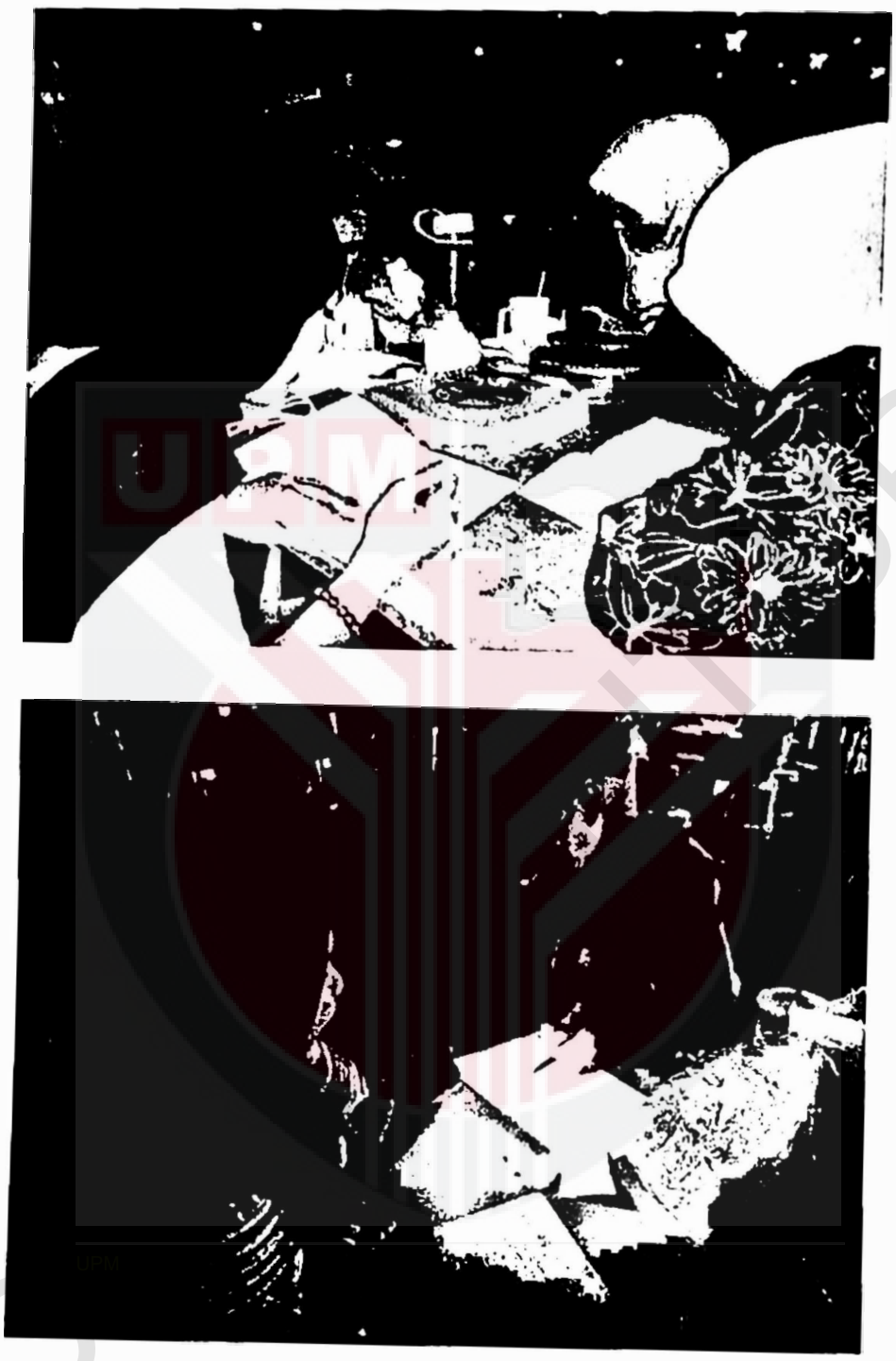
The relevant data were collected from the respondents by individual face-to-face interview based on structured questionnaire.



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