KNOWLEDGE, ATTITUDE, PRACTICE OF NIGHT MARKET FOOD HANDLERS REGARDING THE USE OF REPEATEDLY HEATED COOKING OIL IN KUANTAN, PAHANG

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ABSTRACT

Introduction: The practice of repeatedly heating cooking oil (RHCO) in food preparation has been a common practice among Malaysian mainly among the commercial sector such as night market food handlers. It had been suggested that high consumption of reused oil could impaired human health due to the chemical changes that eventually result in high lipid peroxidation products. Therefore, this study was conducted to study the Knowledge, Attitude and Practice of night market food handlers regarding the use of RHCO. **Methods:** The study involved convenience sampling of 77 night market food handlers from 10 different locations in Kuantan within a two-week period. A set of questionnaires was designed to collect the data from the respondents by face-to-face interview session. **Results:** The mean knowledge score of the respondents was moderate (4.08 out of 7 points) with majority of the respondents (68.8%) agreed that it is a bad practice. Despite that, 89.6% of them admitted that they had used cooking oil repeatedly. Furthermore, respondents with lower level of education had significantly higher knowledge regarding this issue ($p = 0.039$). However, no other correlation was found between practice of RHCO with other variables such as level of education, total knowledge score and monthly sale of the food handlers. **Conclusions:** Most of the food handlers having a moderate level of knowledge and bad attitude and practice towards the use of RHCO**.** A more aggressive actions need to be taken by the respective authorities to address this unhealthy practice, and to spread awareness and ensure safe consumption of fried food among consumers which might improve the health status of Malaysians.

KEYWORDS: Repeatedly, Cooking Oil, Food, night market, knowledge, attitude, practice

INTRODUCTION

Malaysia is known for its popularity and variety of night market selling foods - known locally as '*pasar malam*'. It attracts people from all ages and backgrounds as it provides goods at low price. However, most of the food found in the Malaysian night market are deep-fried food such as banana fritters, fried chicken and fish, fried sausage and fish fritters or locally referred to as '*keropok lekor*' (Azman et. al, 2012). This night market is widely assessable and at least 10 night markets are located in almost every district in Malaysia. According to an

official website of the Pahang government, there are more than 13 different locations of night market food outlets in Kuantan which are accessible in alternating days per week (Official Portal Pahang State Government, 2017). In order to save cost, the use of repeatedly heated cooking oil (RHCO) has been a common practice among Malaysian either for the household or in the commercial sector such as night market food handlers. The oil is repeatedly being used until it turns dark, foamy and emits bad smell. This high dense calorie food can cause a detrimental effect on our health if the same oil is being used repeatedly for frying. In fact, repeatedly heated cooking oil will produce bad chemical substances that are hazardous to the human body. According to Kamsiah & Yusof (2012) and Adriana et al. (2018), the most widely used vegetable cooking oil among Malaysian household and industry for frying purposes is palm oil. Cooking oil when heated will undergo series of chemical reaction such as oxidation, polymerization and hydrolysis which alter constituent of the oil. Some of the by-products also can be absorbed into the fried food such as hydroperoxide and aldehydes (Kamsiah & Yusof, 2012). When heated repeatedly, it will eventually result in lipid peroxidation which will cause the degradation of both chemical and physical state of the cooking oil. Furthermore, according to Leong, Ng, Jaarin & Mustafa (2015), a continuously exposed oil to high temperatures lead to oxidation and increase the peroxidation of polyunsaturated fatty acids (PUFAs) which indicates the lower chemical stability of the oil. Moreover, many research had shown the negative impacts of RHCO. For example, Ku et. al. (2014) reported that RHCO can damage vital organs as it may lead to atherosclerosis and may increase level of reactive oxygen species (ROS) and oxidative stress. Despite the increase findings on harmful effects of RHCO, the numbers are not consistent with the level of knowledge or practice of consumers and food handlers. For instance, studies in 2012 and 2018 revealed that most of the food handlers in Kuala Lumpur and Pulau Pinang respectively had average and low level of knowledge and high level of practices regarding the use of RHCO. The food handlers admitted that they used the same cooking oil several times before discarding it. Therefore, this study was conducted to assess the knowledge, attitude and practice of night market food handlers regarding the repeatedly heated cooking oil in Kuantan, Pahang.

METHODS

This study used a cross-sectional study design which was conducted at 10 selected night markets in Kuantan, Pahang from 24th February until 3rd March 2020. The population involved in this study was the night market food handlers in Kuantan area who are registered under Majlis Perbandaran Kuantan (MPK) to open and operate at the dedicated area. A total of 77 food handlers were recruited by convenience sampling based on single proportion sample size calculation. The respondents were recruited from 10 different locations of night market in Kuantan, Pahang. This location involves Kotasas, Taman Tas, Cenderawasih, Lorong Sekilau 46, Indera Mahkota 1, UTC Pahang, Taman Gelora, Sungai Isap, Lorong Alor Akar 15 and Pasasraya Pantai Selamat IM. These locations were selected based on its distance (15 kilometres) from IIUM Kuantan and accessibility for the investigator. The inclusion criteria of night market food handlers are: 1) Malaysian citizen, 2) aged at least 18 years old and 3) selling only deep-fried food using only vegetable oil for frying. The data obtained was collected through questionnaire and interview sessions with the night market food handlers. The questionnaire and interview sessions were both conducted in Bahasa Malaysia with face-

to-face sessions at their own stall. The questionnaire used in this study were adopted from A man et al. (2012), with minor modification being done to fit the background of this study. The questionnaire consist of three parts: Part (A) – the demographic data of the respondents; Part (B) – the level of knowledge of the respondents regarding the usage of repeatedly heated cooking oil (RHCO); Part (C) – the attitude and practice of the respondents towards RHCO. In the first part, the social demographic data of the respondents were recorded. Data such as gender, age, educational level and monthly income were obtained. The respondents were also asked whether they have attended any food handling training and when was the last time they were attended it. The types of cooking oil used by the respondents were also recorded. In part B, a set of 7 questions were asked to test the level of knowledge of the respondents towards the practice of using Repeatedly Heated Cooking Oil (RHCO). For the first 6 questions, they have 3 options to answer (Agree, Disagree and Not sure) For each correct answer a score was given (the total score is 7). The scores were then summed up and the level of knowledge were classified into three levels based on the mean value i.e. low (0-2), moderate (3-5) and high (6-7). Next, in part C the attitude and practice of the respondents towards the use of RHCO were evaluated. They were asked whether they reuse the oil when frying food and if yes, they were asked again on the frequency the same cooking oil was being used before discarded as well as their reason for reusing the cooking oil. If the answer was no, they will skip to question 4 to answer their reasons. The respondents were also asked on the sources of information they had regarding the issues of repeatedly heated cooking oil either through the newspaper, magazine, mass media such as television, radio, internet and through people such as family members, friends, and in class. All data obtained were analyzed using the SPSS software version 21.0. Descriptive statistic was used to describe the knowledge score of the respondents. The categorical data was analyzed using Fisher's Exact test whereas the numerical data was analyzed using Independent sample T-test.

RESULTS

A total of 77 night-market food handlers participated in this study which all of them were Malay except one Chinese. The age range was between 18 to 58 with the mean age of 34.32 (SD=11.37). Among genders, 71.4% of them were male and only 22 of them were females (28.6%). Most of the respondents had their formal education only in school (75.3%) while others had higher education level until university and above (24.7%). Majority of them (80.5%) had monthly sale of below RM5,000. Unsurprisingly, all of the respondents (100%) claimed to use palm oil for frying. Other details are shown in the Table 1.

Table 1. Socio demographic data of night market food handlers in Kuantan, Pahang (n=77)

Variables	Frequency (Percentage, %)
Gender	
- Male	55 (71.4)
- Female	22 (28.6)
Race	
- Malay	76 (98.7)
- Chinese	1 (1.3)
- Indian	0 (0.0)
Age	
- <21 years old	8 (10.4)
- 21-30 years old	23 (29.9)
- 31-40 years old	27 (35.1)
- 41-50 years old	10 (13.0)
- 51-60 years old	9 (11.7)
- >60 years old	0 (0.0)
Education level	
- None	0 (0.0)
- School	58 (75.3)
- University & above	19 (24.7)
Food Handling Training	
- Yes	72 (93.5)
- No	5 (6.5)
For the 72 respondents who answered 'yes' to the above question no.5, when was the last food handling training attended?	
- <1 year ago	5 (6.9)
- 1-3 years ago	15 (20.8)
- >3 years ago	52 (72.2)
Monthly sale	
- < RM 5000	62 (80.5)
- ≥ RM 5000	15 (19.5)
Types of cooking oil used	
- Palm Oil	77 (100.0)
- Others	0 (0.0)

Knowledge on the use of RHCO

More than half of the respondents (68.8%) disagreed that the usage of RHCO is a good practice for frying. Second, nearly all of the respondents (97.4%) did not agree that the quality of oil used for frying will remain the same regardless of how many times the oil is reheated. Third, only a small number of respondents (5.2%) disagreed that cooking oil can be used for many times and discarded it only when it turns dark. Fourth, a few of them (26.0%) disagreed that the type of cooking oil does not influence the type of by-product produced from the reheated cooking oil. Next, an overwhelming majority of the respondents (88.3%) agreed that there will be a loss of nutrient in the repeatedly heated cooking oil. As expected, most of the respondents (85.7%) that the consumption of RHCO will cause bad effects on health. Of those 66 respondents who agreed that it is bad for health, majority of them (42.4%) agreed that the consumption of repeatedly heated cooking oil can lead to the formation of cancer (Table 2).

Table 2 Frequency and percentage of respondent's knowledge

Question	Frequency (Percentage, %)
1. Usage of repeatedly heated cooking oil for frying food is a good practice as it saves cost and no side effect	
- Agree	18 (23.4)
- Disagree	**53 (68.8)**
- Not Sure	6 (7.8)
2. The Quality of oil used for frying will remain the same regardless of how many times the oil is reheated	
- Agree	2 (2.6)
- Disagree	**75 (97.4)**
- Not Sure	0 (0.0)
3. We can use the oil for many times and discard it only when it turns dark	
- Agree	73 (94.8)
- Disagree	**4 (5.2)**
- Not Sure	0 (0.0)
4. There will be loss of nutrients in the repeatedly heated cooking oil used for frying	
- Agree	**68 (88.3)**
- Disagree	2 (2.6)
- Not Sure	7 (9.1)
5. The type of cooking oil does not influence the type of by-products produced from the repeatedly heated cooking oil	
- Agree	
- Disagree	49 (63.6)
- Not Sure	**20 (26.0)**
	8 (10.4)

	Continued….
6. Will repeatedly heated cooking oil used for frying cause bad effects to our health.	
- Agree	**66 (85.7)**
- Disagree	5 (6.5)
- Not Sure	6 (7.8)
7. For the 66 respondents who answered "Agree" to the above question, what type of disease do they associate with the consumption of RHCO?	
- Cancer	**28 (42.4)**
- Gout	1 (1.5)
- Tuberculosis	3 (4.5)
- Diabetes	1 (1.5)
- Hypertension	23 (34.8)
- Not Sure	10 (15.2)

Note: the **BOLD is the correct answers*

Total Knowledge Score of The Respondents

Based on figure 1, majority of the respondents (76.7%) scored between 3-5 of the total 7 questions on knowledge regarding RHCO (Table 2). Next, the mean of total knowledge score of the respondents is 4.08 which indicates a moderate level of knowledge (SD=1.285). There is a significance difference in the total knowledge score between 'School group' (M= 4.28, SD= 1.21) and 'University & above group' (M= 3.47, SD= 1.35); t(75)= 2.44, p= 0.039.

Attitude and Practice Regarding the use of RHCO

Most of the respondents (89.6%) claimed that they used cooking oil repeatedly for frying. Of those 69 (89.6%) respondents, almost half of them (49.3%) used the same cooking oil for frying up to 4 times or more and all of them admitted that the reason for practicing it was to save cost except one who claimed that there was no proper place for discarding the oil waste. Meanwhile for the 8 respondents who did not practice RHCO, 5 of them claimed that it will damage the quality of their food and other thought that it is harmful to health. Furthermore, majority of them obtained the information related to RHCO from the internet (40.3%). However, 20 of the food handlers stated that they never heard about this issue before. Other information is shown in the Table 3. There is no significance difference in total knowledge score mean of people practicing RHCO (M=4.01, SD=1.32) and those who not (M= 4.63, SD= 0.74); t(75)= 1.28, p= 0.205. There were also no association between practice of RHCO and education level (p=1.000) and monthly sale (p=0.182).

Table 3 Frequency and percentage of respondent's attitude and practice

Question	Frequency (Percentage, %)
1. Do you use cooking oil repeatedly for frying?	
- Yes	69 (89.6)
- No	8 (10.4)
2. For the 69 respondents who answered "yes" to the question above (no.1), how many times is the cooking oil reused before discarded?	
- 2 times	15 (21.7)
- 3 times	20 (29.0)
- 4 times or more	34 (49.3)
3. For the 69 respondents who answered "yes" to the question above (no.1), what are the reasons for using repeatedly heated cooking oil?	
- Save cost	68 (98.6)
- No proper place for discarding the waste oil	1 (1.4)
- No prior knowledge regarding the effect of using RHCO	0 (0.0)
4. For the 8 respondents who answered "No" to the above question (n0.1), what are the reason for not using repeatedly heated cooking oil for frying?	
- Harmful to health	3 (37.5)
- Damaged the appearance, taste and quality of the food	5 (62.5)
- Increase cholesterol level in the cooking oil	0 (0.0)
5. Source where information was obtained regarding the usage of repeatedly heated cooking oil	
- Newspaper	1 (1.3)
- Magazine	0 (0.0)
- Television	5 (6.5)
- Radio	3 (3.9)
- Internet	31 (40.3)
- Family, Friends, Class	17 (22.1)
- No prior knowledge	20 (26.0)
6. Would you like to obtain more information regarding the usage of repeatedly heated cooking oil?	
- Yes	72 (93.5)
- No	5 (6.5)
7. If by chance, the used oil can be sold for biofuel purposes, will you still practice the repeatedly heated cooking oil.	
- Yes	68 (88.3)
- No	9 (11.7)

DISCUSSION

The interview sessions showed majority of the respondents graduated only form school. As mentioned by Sivananthan et al. (2013), this type of business does not require higher education but more to the experience gained throughout years running this business. The study also revealed that majority of them have below RM5000 of monthly income. This is due to the limited variation of the total food items especially fried food in order to avoid any loss of the business and wastage of the food (Adriana et al., 2018). This was also supported by Wai (2007), which highlighted on the limited choices of food products offered by the food handlers operating a small-medium scale of business. Majority of the respondents agreed that the use of RHCO is a bad practice and will degrade the quality and nutrient content of the cooking oil. Almost all of them (85.7%) also agreed that the use of RHCO will cause deleterious effects on health. However, they were still repeatedly using the same cooking oil for frying. This matches their answer in question 4, Part B which most of them (94.8%) agreed that they could still use the same cooking oil and only discard it once it turned dark. This mean they had a perception that the cooking oil can be used repeatedly as long as there was no formation of foam, darken colour and changes in odour. As mentioned by Wai (2007), food handlers discarded the cooking oil only when it seems to be necessary regardless on the duration and cooking sessions of the used oil. However, the physical changes occurred cannot be the cutline as it may be that the oil has already exceed the safe limit at which it needs to be discarded. Next, majority of them were having moderate level of knowledge regarding RHCO. This may due to the lack of RHCO-related information exposed to them. In fact, this RHCO issue was not being highlighted during the food handling course based on the MyHEALTH official portal of the Ministry of Health (Aimi, 2016) and based on the latest Food Handler Training Course module (Ministry of Health, Malaysia, 2019). This study also discovers that respondents from lower education level have significantly more knowledge regarding the use of RHCO compared to higher education level.. This might due to the early exposure of food handling experience which they might learn it from those who have been in the field for years. Therefore, information on RHCO should be included in food handling course to increase the level of awareness and knowledge which can be translated into the good practice of RHCO. A huge number of the respondents were practicing RHCO (89.6%). Nearly half of them (49.3%) re-use it for frying up to 4 times or more before discarding it. This results of food handlers practicing RHCO (89.6%) are the highest as compared to previous studies by Azman et al. (2012); Sivananthan et al. (2013); Azman et al. (2015); Adrianan et al. (2018), all showed high percentage of respondents practicing RHCO with 63.0%, 86.6%, 73.2% and 70.2% respectively. However, since all of them were using palm oil for frying, it seems to be a better choice due to its unique composition of fatty acids. According to Jaarin & Kamisah (2012), the greater proportion of MUFA and low percentage of PUFA of palm oil making it more resistant towards lipid peroxidation. Two studies conducted by Jaarin & Kamisah (2012) and Adriana et al. (2018), recorded a peroxide value (PV) value of exceeding the safe limit recommended by American Oil Chemists' Society (AOCS) which at 10meqO_2/kg when the oil is reheated until 5 times using sliced potatoes and conducted in a controlled lab

environment. According to Choe & Min (2007), the PV values of a used oil were influenced by factors such as type of food that is deep fried, the different types of oil and utensils used during the frying process. If the cooking oil was being used repeatedly to deep fry tubers, vegetables or other plant-based products such as banana fritters and potato chips, the PV value will be low hence, the cooking oil is considered safe to be reheated up to 5 times. However, the PV values can go very high after deep frying meat-based products such as chicken, sausage and *kerepok lekor* which will accelerate the degradation and lipid peroxidation formation of the cooking oil and also changes its physical appearance. This might explain why there were some of the respondents reused the cooking oil only for 2 – 3 times, while others up to 4 times or more. Furthermore, one study by Azman et al. (2012) which measure the PV value of collected samples of frying oil from various night market in Kuala Lumpur showed that only 18% of the cooking samples collected were considered safe to consume based on the AOCS guideline (10meqO_2/kg), while up to 62% if based on the Food Sanitation Law of Japan Guideline (30 meqO_2/kg). This proves that at least, nearly half of the cooking oil used by the food handlers were not safe for human consumption. In addition, for other 8 (10.4%) of the respondents who did not practice RHCO, most of their reason were the physical attractiveness of the fried food. While only 3 of them believe that such practice is harmful to health. Besides, most of the respondents were interested in gaining more information related to this matter which can be a good opportunity for the public health officials to conduct an awareness campaign, or add a new syllabus related to RHCO in the food handling training course. Next, similar to the previous study by Azman et al. (2012), this study also stated that the respondents' practice of RHCO were not influenced by these three factors; (i) the knowledge they have related to RHCO issue; (ii) their education background; (iii) the income from their monthly sale. As mentioned in question 3 part C, the ultimate concern of those who were practicing RHCO was to reduce the production cost. However, it should not be banned completely as scientific papers have proven that there are still numbers of repeatedly frying allowed and consider safe for human consumption as long as the PV value is not exceeding the safe limit. Therefore, it is suggested that the government, food inspector and related health officials to set a standard guideline and limit for how long the cooking oil can be used, so that the practice of RHCO among food handlers can be controlled.

CONCLUSION

Food handlers in Kuantan have a moderate level of knowledge and poor attitude and practice towards the use of RHCO. However, there are still room for improvement to increase the knowledge regarding this issue either in theory classes or through on-site training. Although this study suggests that there was difference in knowledge level between lower and higher education group, any campaign or initiative to elevate their awareness related to this issue should be targeted to all group regardless of their education background. More field

studies should be executed to measure the quality of the used cooking oil used by the food handlers.

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