



RESEARCH PAPER

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Level of knowledge, attitude and practice of food outlet operators in Raub, Pahang morning market regarding the usage of repeatedly heated cooking oil- A cross sectional study**Manoharan Sivananthan^{1*}, Manoharan Elamaran², Kaur Jasmin¹, Rajandran Kushha¹***¹Department of Biomedical Science. Faculty of Biomedicine and Health, ASIA Metropolitan University, Malaysia**²Faculty of Pre University, Mahmud Secondary School, 27600 Jalan Tras, Raub, Pahang, Malaysia***Article Published: 17 May 2013****Key words:** Morning market, repeatedly heated cooking oil, raub, food outlet operators, survey.**Abstract**

From the literature survey, no published data was found regarding the topic of repeatedly heated cooking oil from Raub, Pahang. Thus this study was designed to evaluate the level of knowledge, attitude and practice of food outlet operators in Raub, Pahang morning market regarding the usage of repeatedly heated cooking oil. Food prepared from repeatedly heated cooking oil becoming a common issue in Malaysian setting. Few related articles to this topic (not focusing Raub) has been published previously also mentioning the seriousness of this practice to the health of human being. The main purpose of the food operators using repeatedly cooking oil because to saves cost. Level of knowledge, attitude and practice of food outlet operators in Raub, Pahang morning market regarding the usage of repeatedly heated cooking oil need to be improved. Many of the consumers not aware of the danger of using the repeatedly heated cooking oil. Only small portion of consumers aware of this situation. This small portion need to be changed to a bigger portion of consumers who well aware of this situation. This only can be achieved by doing campaign by health related agencies to create awareness that repeatedly heated cooking oil can cause harm to the health. Apart from these agencies, public must play a role in spreading the information to relatives, friends and family members. These spread of words can go viral if everyone aware the consequences of consuming repeatedly heated cooking oil. Prevention is better than cure.

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Introduction

Either in commercial sector or in household pattern, repeatedly usage of the same frying oil becoming a common practice which is mainly intended for cost saving or reduction of cost to make the product available for the consumption. According to literature survey, the oil is discarded only when the oil becomes foamy, produce bad smell or when the color of the repeatedly used oil turn dark (Azman *et al.*, 2012).

In the presence of moisture and air, complete immersion of food into frying oil is known as deep frying process where this process is carried out at the temperature between 160- 190°C. When performing deep frying process, the cooking oil is heated up to achieve the desired temperature and during this process reaction of chemical takes place. The chemical reaction that occur involved are oxidation, hydrolysis and thermal polymerization. Due to increasing of time in frying process, the oil quality is reduced. This situation occurs because within the frying medium, rapid production of the oxidize and polymerized lipid species take place (Azman *et al.*, 2012).

During the deep frying process, in the beginning stage of oxidation two main products are formed which are hydroperoxides and aldehydes. These two main products are then absorbed into the food which is introduced into deep frying process. According to the researchers, using the peroxidase value of the oil used for frying process can determine the extent of oxidation taken place. Consumption of repeatedly used oil can cause harm to the health of consumer but among Malaysian, this practice become common and without awareness that this type of oil can harm the health (Kamisah *et al.*, 2012).

Question may arise 'what happen to the oil which is discarded?' According to the author who did a good review of repeatedly used deep fried oil mentioned that in abroad, this type of oil has it's own market where the oil will be processed further and recycle as biofuel. What happen when there is no market to process this

type of waste vegetable oil? The author further mentioned that the staff of establishment probably will bring home and use the oil for cooking. In Malaysian scenario, according to the author there is popular but unsubstantiated belief that this used oil will be introduced in the *wok* of "pasar malam" trivial trader after obtained it from the frying food industries. The author further added that Malaysian Food Act and Regulations, September 2005 has no provision for frying oil quality and this mean that usage of repeatedly used cooking oil is not prohibited and the food makers can discard the oil whenever it is necessary (Wai, 2007).

When taken into consideration from nutritional viewpoint, the nonvolatile products of degradation are more important. The reason is because they remain in the oil, and they are absorbed by the food during the frying process, and are later the consumer consume the food. Polymers and the polar compounds are among these nonvolatile products (Soriguer *et al.*, 2003).

What are the factors that can affect the quality of cooking oil during heating? According to a group of researchers they mentioned that several factors can be included like ventilation, temperature and heating duration during the process of frying takes place, oil type, the oil saturation ratio, and the presence of a catalyst/antioxidant. When heating of oil is repeated especially at high temperature ($\geq 180^{\circ}\text{C}$), this condition will lead to changes in fatty acid where it change from the *cis* isomer to the *trans* isomer. From a research conducted by these researchers found that chronic consumption of heated palm and soy oils for the duration of 24 weeks lead to significant increase in blood pressure. This proved that usage of repeatedly heated cooking oil can lead to health problem. They also further mentioned that when this oil is heated repeatedly, free radicals are generated and vitamins and antioxidants levels are reduced which lead to oxidative stress (Jaarin *et al.*, 2011).

Vegetable oils that used for cooking contain excellent source of vitamin E at the concentration of between 15 and 49 mg a-tocopherol equivalents/100 g. During heating, the process of oxidation of unsaturated fatty acids lead to the lost of vitamin E. During cooking of the food, the food is absorbing the frying oil. The amount of the oil absorbed by the food based on the quality of the oil used for cooking process and this affect the amount of vitamin E's net intake (Ghidurus *et al.*, 2010).

Reusing oil practice during food preparation processes is widespread. Moreover, this practice is not only restricted to roadside food stalls, reputable food outlets in large capitals throughout Malaysia also use this technique so that they can cut costs. The repeated heating of cooking oil will result in oil that is more prone to lipid peroxidation (Jaarin *et al.*, 2011).

This research was conducted to determine the level of knowledge, attitude and practice by food outlet operators in Raub, Pahang morning market regarding the usage of repeatedly heated cooking oil. Raub is a district which is situated in Pahang state, Malaysia. To the best knowledge, no research has been published so far with data of food outlet operators from Raub, Pahang. Several areas in Raub were included in this research to determine level of knowledge, attitude and practice by food outlet operators.

Material and methods

Study design

This was a cross sectional study and was conducted in the area of Raub throughout the month of March 2013. 9 morning markets were chosen for this study.

Study population

82 food operators from 9 morning market (*pasar pagi* - local language) were included in this study. The areas include Lembah Klau, Sungai Klau, Ulu Gali, Sungai Ruan, Raub town (only on Sunday morning), Sungai Lui, Batu Talam, Koyan, Cheroh.

Inclusion criteria of food operators

The food operators must be a Malaysian citizens and age 18 years old and above. Must sell food which are included in category of deep fried food.

Example of food in the category of deep fried food

All foods which are included in deep frying process like French fries, keropok lekor, fried banana fritters, fried tubers such fried sweet potato, yam or cassava fritters, fish cakes, fried chicken and fried sausages (Azman *et al.*, 2012)

Research methods

Interviews and questionnaires. The questionnaires were adopted from Azman *et al.*, 2012. The questions in the questionnaires were separated into three parts. Demographic study of participants, participants' knowledge of the usage of repeatedly heated cooking oil, and participants' attitude and practice regarding the usage of repeatedly heated cooking oil. The title of this research paper was adopted from Azman *et al.*, 2012 with some modification where these researchers focused on night market in Kuala Lumpur and the current research focuses on morning market in the area of Raub, Pahang.

Result and discussion

In Table 1, altogether 82 participants were take part in this research. In term of demographic study of the participants, males were higher in number than females where male participants were 44 and female 38. These 82 participants were sum of all participants from the 9 morning market food operators. From these 82 participants, Malays were higher in number than Chinese and no Indian food operator were doing deep frying food business at any of the 9 locations. 62 were Malays participants with 20 Chinese participants. When narrowly focused in the age breakdown, the age group between 40-44 were recorded as the highest with 15 participants followed by 30-34 and the rest. The type of oil used for the frying process in morning market by food operators was palm oil with all 82

participants agreed that palm oil was chosen by them for the business. It was not a surprising data since in the world, Malaysia is a largest producer and also exporter of palm oil. The reason for choosing palm oil as main type of oil is because it is cheaper compare to other type of oil and is widely available in every part in Malaysia. Compare to soy and corn oil are not use since these type of oil are expensive but different story in Costa Rica where corn, sunflower, soy oils are preferred choice although palm oil still cheaper than the oil type mentioned above. This is because the respective stake holder involve in aggressive marketing and advertising campaign as well as the creation of perception by influential industries that mentioning that their oil is healthier compare to the palm oil. These type perception are not extensive in Malaysia and campaign in Malaysia are promoting health benefits of using palm oil with the strong back up from the successful government public campaign on using palm oil in cooking (Azman *et al.*, 2012).

Secondary education topping the table for the level of education of the participants followed by none and primary education. From the interview with the participants with no education, they mentioned that for this kind of business higher education is not required. The only requirement is need to know how to do small mathematic problem solving especially involving money. For them although they have no education but from the experience they gain throughout doing this business for many years, they learn to solve simple mathematical questions.

From the table 2, for the question of “Usage of repeatedly heated cooking oil for frying food is a good practice as it saves cost and no side effect due to this practice” 53 out of 82 participants were not agreed and 29 of them agreed. Actually the practice of using the same oil is not a good practice and majority of people use these oil to save cost and each time using repeatedly heated cooking oil for frying food, the nutritional level getting lesser and tend to produce side

effect. According to a group of researchers, they mentioned that the usage of repeatedly heated cooking oil to save cost and increase in lipid peroxidation and reduction of antioxidant properties of oil leading to production of the free radicals consequences of repeated heating of the cooking oil. In term of side effect, these researchers further mentioned that oxidative stress induces by free radicals is linked with the development of atherosclerosis (Xian *et al.*, 2012).

Table 1. Demographic data of Raub morning market food outlet operators who took part in the study.

Data	Number (%)
Total participants:	82 (100%)
Gender:	
Male	44 (53.66)
Female	38 (46.34)
Race:	
Malay	62 (75.61)
Chinese	20 (24.39)
Indian	0 (0.00)
Age:	
<25	4 (4.88)
25- 29	9 (11.00)
30- 34	14 (17.07)
35- 39	11 (13.41)
40- 44	15 (18.29)
45- 49	7 (8.54)
50- 54	8 (9.76)
55- 59	4 (4.88)
60-64	3 (3.66)
65-69	2 (2.44)
>70	5 (6.10)
Type of oil used for frying process:	82 (100%)
Palm oil	
Education level:	
None	14 (17.07)
Primary	8 (9.76)
Secondary	60 (73.17)
Tertiary	0 (0.00)

For the question “The quality of oil used for frying will remain the same regardless of how many times the oil is reheated” 59 of the participants were disagreed with 16 were agreed and 7 were not sure. In fact the quality of oil will not remain same once it is introduced into deep frying process. This statement is further supported with the statement of researchers where they mentioned that higher free fatty acid contents are

present in the reheated oil and the usage of this type of oil is not recommended (Katragadda *et al.*, 2010).

Table 2. Participants' knowledge of the usage of repeatedly heated cooking oil.

Questions	Number (%)
Usage of repeatedly heated cooking oil for frying food is a good practice as it saves cost and no side effect due to this practice.	n= 82
Agree	29 (35.37)
Disagree	53 (64.63)
Not sure	0 (0.00)
The quality of oil used for frying will remain the same regardless of how many times the oil is reheated.	n=82
Agree	16 (19.51)
Disagree	59 (71.95)
Not sure	7 (8.54)
We can use the oil for many times and discard it only when it turns dark.	n= 82
Agree	14 (17.07)
Disagree	67 (81.71)
Not sure	1 (1.22)
There will be loss of nutrients in the repeatedly heated cooking oil used for frying	n=82
Agree	33 (40.24)
Disagree	19 (23.17)
Not sure	30 (36.59)
The type of cooking oil does not influence the type of by-products produced from the repeatedly heated cooking oil.	n=82
Agree	11 (13.41)
Disagree	13 (15.85)
Not sure	58 (70.73)
Will repeatedly heated cooking oil used for frying cause bad effects to our health?	n=82
Yes	59 (71.95)
No	10 (12.20)
Not sure	13 (15.85)
For the 59 respondents who answered "yes" to the above question (question no. 6), what type of disease do they associate with the consumption of repeatedly heated cooking oil?	n=59
Gout	0 (0.00)
Tuberculosis	0 (0.00)
Diabetes	8 (13.56)
Hypertension	19 (32.20)
Cancer	32 (54.24)

Table 3. Participants' attitude and practice regarding the usage of repeatedly heated cooking oil.

Question	Number (%)
Do you use cooking oil repeatedly for frying?	n=82
Yes	71 (86.59)
No	11 (13.41)
For the 11 respondents who answered "No" to the above question (question no. 1), what are the reasons for not using repeatedly heated cooking oil for frying?	n=11
Harmful to health	8 (72.73)
Food will look bad	0 (0.00)
Increases cooking oil's cholesterol level	3 (27.27)
For the respondents who use the same cooking oil repeatedly for frying, how many times is the cooking oil reused before discarded?	n=71
2 times	43 (60.56)
3 times	19 (26.76)
4 times or more	9 (12.68)
Source where information was obtained regarding the usage of repeatedly heated cooking oil	n=82
Newspaper	31 (37.80)
Magazine	2 (2.44)
Television	4 (4.88)
Radio	0 (0.00)
Internet	1 (1.22)
Family/Friends/Other people	11 (13.41)
No prior knowledge about this issue	33 (40.24)
Do the respondents would like to obtain more information about this issue?	n=82
Yes	47 (57.32)
No	35 (42.68)

For the third question "We can use the oil for many times and discard it only when it turns dark." With 67 participants were disagreed, 14 participants agreed with 1 was not sure. The oil should not be used until it turns dark. Besides, the usage of repeated oil is not a good practice and oil should be discard after each cooking process and not wait until it turns dark.

For the question number four "There will be loss of nutrients in the repeatedly heated cooking oil used for frying" with 33 agreed, 19 disagreed and 30 not sure

whether the nutrient will be loss or not. Loss of nutrient will takes place in the repeatedly heated cooking oil. This statement is further supported by Azman *et al.*, 2012 where they mentioned that destruction of vitamin E takes place due to the repeated heating of cooking oil. Furthermore the repeated heating of cooking oil will lead to oxidation of fatty acids.

For the question number 5 “The type of cooking oil does not influence the type of by-products produced from the repeatedly heated cooking oil” with 11 agreed, 13 disagreed and 58 not sure. Type of cooking oil influence the type of by products produced. This statement is further supported by Azman *et al.*, 2012 where they mentioned that the rate of formation of cooking oil decomposition products be governed by the food type being fried, the type of oil used and the fryer design.

“Will repeatedly heated cooking oil used for frying cause bad effects to our health?” and for this question 59 answered yes, 10 answered no and 13 were not sure. Repeatedly heated cooking oil cause bad effect to the health. According to a group of researchers they mentioned that the common practice of reusing these heated oils may cause harm to tissues since frying using this type of oil may produce more free radicals (Jaarin *et al.*, 2006).

For the last question in the table 2, “For the 59 respondents who answered “yes” to the above question (question no. 6), what type of disease do they associate with the consumption of repeatedly heated cooking oil?” 32 answered cancer, while 19 answered hypertension with 8 answered diabetes. According to a literature survey, cancer is associated with the consumption of repeatedly heated cooking oil (Macrae, 2006). Consumption of repeatedly heated cooking oil has association with hypertension (Jaarin *et al.*, 2011). No published data reported that diabetes in association with consumption of repeatedly heated cooking oil.

From the table 2, participants’ knowledge of the usage of repeatedly heated cooking oil were recorded. As a summary of level of knowledge, for all 7 questions, positive answers were higher than negative answers. These proved that level of knowledge of participants regarding the usage of repeatedly heated cooking oil is average high. Although no parameter was introduced to measure the result recorded in the table 2 but from the coarse view of the data recorded, it shows that level of knowledge among the participant is average high.

The data of participants’ attitude and practice regarding the usage of repeatedly heated cooking oil were recorded in table 3. 71 answered yes and 11 answered no for the question number 1 “Do you use cooking oil repeatedly for frying?” For question 2 “For the 11 respondents who answered “No” to the above question (question no. 1), what are the reasons for not using repeatedly heated cooking oil for frying?” 8 answered harmful to health and 3 answered increases cooking oil’s cholesterol level. For question number three “For the respondents who use the same cooking oil repeatedly for frying, how many times is the cooking oil reused before discarded?” 43 answered 2 times, 19 answered 3 times and 9 were answered 4 times and more. For the fourth question “Source where information was obtained regarding the usage of repeatedly heated cooking oil” Newspaper (31),

Magazine (2), Television (4), Radio (0), Internet (1), Family/Friends/Other people (11), No prior knowledge about this issue (33). Out of 82 participants in this research, 31 of them admitted that newspaper is the medium for them to get to know about the danger of the repeatedly heated cooking oil and 33 of them never heard about the issue of danger of repeatedly heated cooking oil. For the fifth question “Do the respondents would like to obtain more information about this issue?” 47 answered yes and 35 answered no. More than half of them would like to obtain the information about this issue.

Limitation of current research

There were some limitation in this research where this was a cross sectional study where the accuracy of data recorded were effective at the time survey was done. After that when again wanted to do the same survey, some variation may be expected. Example the same food operator is no more doing business due to bankruptcy or sick or death or switch to do other business. With other word cross sectional study is a snapshot of situations present at that instant.

Inclusion of more participants will produce better result since more answer can be gathered to make a concrete conclusion on the topic of repeatedly heated cooking oil.

During interview session, information that provided by the food outlet operators may true and may not because they might think that problems may arise for their business if answered negatively and they may modified their answers for that moment.

Conclusion

Level of knowledge, attitude and practice by food outlet operators in Raub, Pahang morning market regarding the usage of repeatedly heated cooking oil need to be improved. Many of the consumers not aware of the danger of using the repeatedly heated cooking oil. Only small portion of consumers aware of this situation. This small portion need to be changed to a bigger portion of consumers who well aware of this situation. This only can be achieved by doing campaign by health related agencies to create awareness that repeatedly heated cooking oil can cause harm to the health. Apart from these agencies, public must play a role in spreading the information to relatives, friends and family members. These spread of words can go viral if everyone aware the consequences of consuming repeatedly heated cooking oil. Prevention is better than cure.

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