THE AWARENESS OF CANCER AND ITS ASSOCIATION WITH CONSUMPTION OF FOOD HIGH IN NITROSAMINE: KNOWLEDGE, ATTITUDE, PRACTICE (KAP) AMONG IIUM KUANTAN UNDERGRADUATE STUDENTS

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ABSTRACT

Introduction: The trend in consuming preserved food, pickled food and processed food has been widely developed. This type of food contributes to high nitrosamines formation. Nitrosamines are the end product of N-nitroso compounds (NOCs) and high consumption of food containing nitrosamine leads to cancer development. The aim of this research is to explore the level of knowledge, attitude and practice among IIUM Kuantan undergraduate students regarding the awareness of consumption of food high in nitrosamines as a risk factor of cancer and their relationships. **Methods:** A total of 162 students were conveniently recruited. A self-administered questionnaire and an online survey questionnaire were distributed. The questionnaire consists of sociodemographic data and questions on awareness of subjects regarding the topics and comprises of knowledge, attitude, practice of students regarding the topic. **Results:** Majority of the respondents (n=102, 63%) depicted moderate knowledge related to nitrosamine, while 49.4% of the respondents portrayed a poor level of attitude towards this issue. More than half of the respondents (51.9%) were categorized in the high nitrosamine-consumption group. Furthermore, this study showed a significant

association between knowledge and attitude (ρ=0.002) and no significant association between knowledge and practice (ρ=0.953) regarding the awareness of consumption of food high in nitrosamines as a risk factor of cancer. **Conclusion**: This study indicates that knowledge regarding nitrosamine is associated with a good attitude. However, knowledge regarding nitrosamine is not necessarily associated with good practice regarding the consumption of food high in nitrosamine.

KEYWORDS: Nitrosamines, Cancer, Knowledge, Attitude, Practice

INTRODUCTION

The trend in consuming preserved food, pickled food and processed food has been widely developed in our country. Research has shown that consumption of this type of food is high among Asian people compared to westerners (Jakszyn & Gonzalez, 2006). As we can see in Malaysia, many restaurants serve foods high in nitrosamine. Besides, it is preferable by our culture to eat this kind of food as it is easily accessible and affordable. For instance, fish and vegetable preservation are highly practiced as the source of these foods is in excess, hence preservation is done to increase the shelf-life. Thus, this type of diet contributes to high nitrosamines formation in the body. In general, nitrosamines are chemical compounds that contribute to carcinogenic properties that are frequently used in the manufacture of cosmetics, pesticides, tobacco products, rubber products and food products (Dietrich et al., 2005). Nitrosamines and nitrosamides are two chemical classes from N-nitroso compounds (NOCs) which are the end product from the reaction of amines and amides with nitrosating agents derived from nitrite. In general, high consumption of NOCs leads to a high formation of nitrosamines. Nitrosamines are formed from the reaction of tertiary amines with a nitrosating agent. For example in foods, the nitrosating agent is nitrous anhydride formed by nitrite in an acidic solution. The reaction of the food component and the physical make-up of the food lead to the formation of nitrosamine (Zheng et al, 2018).

According to studies that had been conducted, nitrosamine shows a neuro-carcinogenic effect in animal models (Ohgaki, 2009). Furthermore, in other studies, diet with high exposure to NOCs was shown to contribute to glioma risk (Dubrow et al., 2010). Equally important, there is also an association between NOCs to the development of gastric cancer, esophageal cancer, and colon cancer (Song, Wu & Guan, 2015). NOCs are potential human carcinogens, which include N-nitrosodimethylamine (NDMA) the form of nitrosamine found in food (Grosse et al, 2006). The problem arises as Malaysian have low awareness on the consequences of consuming excessive nitrosamine in food and its effect on the body. High consumption

of food containing nitrosamine leads to cancer development. As stated in The Star Online (2004), according to a study by Universiti Kebangsaan Malaysia's Federal Science Faculty Centre found that 65% to 75% of patients with digestive system cancer admit to have consumed anchovies, prawn paste, dried prawn and salted fish for the past 10 to 15 years.

Educating people with correct knowledge is important in guiding the right practice to reduce cancer risk by altering the diet trend and lifestyle. According to Key et al (2004), the risk factor for nasopharyngeal cancer can be reduced by consuming a moderate amount of salted fish. Besides, by eating fruits and vegetables at least 400 g/d can reduce the risk for oral, esophagus, stomach, and colorectal cancer. Salted preserved foods and high salt intake must be controlled and consumed in moderate amount to prevent the risk of developing stomach cancer. The review showed that cancer can be reduced by changing diet style. This study was conducted to assess the epidemiological evidence on diet and cancer and make public health recommendations.

METHODS

Subjects

The source of population in this study included IIUM Kuantan undergraduate students from six different Kulliyah including Kulliyyah of Allied Health Sciences (KAHS), Kulliyyah of Medicine (KOM), Kulliyyah of Nursing (KON), Kulliyyah of Pharmacy (KOP), Kulliyyah of Dentistry (KOD) and Kulliyyah of Sciences (KOS).

Instrument

The questionnaire consists of 28 questions in total, which were divided into two parts which are part A and part B. Part A consist of sociodemographic data and question on awareness of subjects regarding the topics. There are 4 questions to measure the level of awareness among students regarding the topics. Whereas part B consists of knowledge of students regarding food high in nitrosamines and its association with cancer. This includes 12 questions with true, false or unsure options for each question. The second part is on the attitude of students towards food high in nitrosamines and its association with cancer. It consist of 11 questions and the answer provided are in a Likert-scale as follows: '1 = strongly disagree', '2 = disagree', '3 = no opinion', '4 = agree' and '5 = strongly agree'. Then the last part in part B are questions on practices regarding the consumption of food high in nitrosamines. Part B consists of 5 questions on the practice of students in consuming food that contribute to the high formation of nitrosamines.

Statistical Analysis

The collected data was analyzed using Statistical Package Software for Social Science (SPSS) version 12.0.1. Descriptive analysis were used to assess the level of knowledge, attitude and practices about the association of cancer with consumption of food high in nitrosamines. Pearson's correlation was used to measure the association between the level of knowledge and attitude, and the level of knowledge and the consumption of food high in nitrosamine among IIUM Kuantan undergraduate students. The statistical significant level was set to less than 0.05. The normality assumption was checked prior to the test. The mean and the standard variation was used when it is normally distributed.

RESULTS

Knowledge regarding food high in nitrosamine as a risk factor for the development of cancer

Based on the questionnaire distributed, the respondents had been asked to state either the facts regarding food high in nitrosamine as a risk factor for the development of cancer is true, false or unsure. The scores of the respondents were categorized into three which are poor (< 25%), moderate (25% to 75%) and good (> 75%). For poor <25% is score 0 to 2.99, moderate 25% - 75% is score 3.00 to 9.99 and good >75% is score 10.00 to 12.00. From the table, it can be seen that 2 (1.2%) of the respondents achieved a good score and 102 (63.0%) scored moderate. The remaining 58 (35.8%) respondents score was in the poor category. Lastly, the overall mean score ($\bar{x}$ = 3.70) showed a moderate level of knowledge of the respondents.

Table 1 Categories of knowledge group among 162 students

Knowledge group	Frequency	%	Mean ± SD
Good	2	1.2	3.70 ± 2.913
Moderate	102	63.0	
Poor	58	35.8	

Attitude towards food high in nitrosamines as a risk factor for the development of cancer

Based on Table 2, the scores is summarized into three categories which are poor (< 25%), moderate (25% - 75%) and good (> 75%). For poor <25% is score 0 to 2.75, moderate 25% - 75% score is 2.76 to 8.25, and good >75% the score was 8.26 to 11.00. From the table, it can be seen that 11 (6.8%) respondents provided a good score and 71 (43.8%) of them are in the moderate score category. While 80 (49.4%) of the respondents scored poorly. Lastly, the overall mean score ($\bar{x}$ = 2.68) showed a poor level attitude of respondents.

Table 2 Categories of attitude group among 162 students

Attitude group	Frequency	%	Mean ± SD
Good	11	6.8	2.68 ± 2.711
Moderate	71	43.8	
Poor	80	49.4	

Practice in the consumption of food high in nitrosamine

The practice towards consumption of food high in nitrosamine was assessed based on five questions related to the consumption of food containing nitrosamine. The respondents were divided into high practice group and low practice group. The high practice group score is 2.51 to 5.00, while for low practice group score was 0 to 2.50. As shown in Table 3, the number of respondents in the high practice group is 84 (51.9%) and the low practice group is 78 (48.1%). It is shown that more than half of the respondents consumed this type of food as tabulated in Table 4.10. Lastly, the overall mean score ($\bar{x}$ = 2.59) for practice showed high practice group of respondents.

Table 3 The groups of students in consuming food contain nitrosamine**.**

Practice group	Frequency	%	Mean ± SD
High	84	51.9	2.59 ± 1.043
Low	78	48.1	

The relationship between knowledge, attitude and practice regarding food high in nitrosamine and its association with cancer

Table 4 describes the relationship between knowledge, attitude and practice regarding food high in nitrosamine and its association with cancer. Pearson correlation test was used in order to assess the association between knowledge-attitude and knowledge-practice score among the respondents. As shown in Table 4, there was a significant correlation between knowledge and attitude regarding food high in nitrosamine and its association with cancer. It showed significant weak positive correlation ($r = 0.245$, $p = 0.002$). The correlation showed, the higher the knowledge, the better the attitude of respondents towards nitrosamine consumption. Then, there was no significant relationship between knowledge and practice and the -p-value was 0.953 which is more than 0.05 and the r is uninterpretable.

Table 4 The relationship between knowledge, attitude and practice regarding food high in nitrosamine and its association with cancer (n = 162)

Item	Correlation, r	-p-value
Knowledge - Attitude	0.245	0.002
Knowledge - Practice	-0.005	0.953

DISCUSSION

Since the study on food high in nitrosamine and its relation to cancer is limited in Malaysia, there is no previous study to compare the knowledge, attitude and practice on food high in nitrosamine as a risk factor for the development of cancer among target populations. Most studies regarding this topic involved clinical and qualitative research. This is the first study addressing a quantitative study approach to analyse the knowledge, attitude and practice of university students on food high in nitrosamine as a risk factor for the development of cancer.

The issue on the consumption of food high in nitrosamine should not be overlooked. Our government has taken action to create awareness among the general population by spreading this concern through mass media and newspapers. Based on a study by Universiti Kebangsaan Malaysia, about 65% to 75% of cancer patients consume salted fish, dried prawns and prawn paste for the past 10 to 15 years (The Star Online, 2004). As it was reported, eating habit plays a role in the formation of various cancer. Besides, this type of food is frequently consumed among the general population. As reported in the article written by Jakszyn & Gonzalez (2006), the consumption of food such as salted fish and processed meat are commonly high in Asian diet compared to the Western diet which shows that Asian people widely practice consumption of

food high in nitrosamine. This may be due to the accessibility of food such as fish. So, food is preserved to sustain life for long-term uses.

Knowledge

This study also depicted that knowledge of food containing nitrosamine among IIUM Kuantan undergraduate students was at moderate level. In addition, majority of the respondents answered incorrectly which highlights the lack of knowledge on the dangers of nitrosamine. It is uncommon knowledge as it was not officially shared during formal classes. Other than that, society places more emphasis on the issue of nitrosamine in cigarettes than on the content of nitrosamine in food. This might due to this type of diet is widely consumed and this issue was not emphasized by the local health authorities and mass media. The statement on "*Positive association toward various gastrointestinal cancer with high consumption of food rich in nitrosamines*" showed that 59 (36.4%) of respondents are able to provide the correct answer. Specifically, more than half of them unable to choose the correct answer. This showed the respondents seem to acknowledge the danger in excessively consuming nitrosamine. However, an official guideline on the tolerable level of nitrosamine in food to the body is not included in any guideline references such as recommended dietary allowance (RDA). This displayed the knowledge is not convincing enough to make people cautious. Studies regarding food containing nitrosamine showed many positive relationships between the consumption of food high in nitrosamine with the development of cancer. A study conducted by Larsson, Bergkvist and Wolk, (2006), reported that the higher risk of gastric cancer is linked with the increasing trend in consuming processed meat which containing nitrosamine. Besides, Song, Wu and Guan (2015) mentioned it their study that NDMA is a cancer-causing agent which equipped for prompting threatening tumors in different creature species in an assortment of tissues, including liver, lung, and stomach. The respondent's low knowledge regarding this probably because cancer-related to consuming food contained nitrosamine is uncommon among the population.

This study found that 11(6.8%) of the respondents acknowledge the statement "*Nitrosamine formation can be reduced by the addition of ascorbic acid and vitamin E in the food ingredients*". Majority of the respondents answered incorrectly which highlights the inability of the students in identifying that nitrosamine caused cancer. Despite students from medical background who might know about vitamin C and vitamin E in preventing cancer, the low knowledge in nitrosamine lead them to score poorly for this statement. Vitamin C and E can inhibit the formation of carcinogenic nitrosamines effectively (Loh et al, 2011). It was also supported Mastrangelo., et al (2016) vitamin C with optimum concentration helps to destroy various distinctive human tumors. Moreover, vitamin C may activate the immune system and Pharmacological dosages of

nutrient C may hinder malignant growth change in a few pathways (Pawloska, Szczepanska and Blasiak, 2019). Based on the finding, lack of knowledge regarding nitrosamine in food could be the reason why this statement scored poor correct answer.

Attitude

Apart from that, this study shows that majority of the respondents have a poor positive attitude towards food high in nitrosamine and its association with cancer. Practically, not more than half of them strongly disagree with the statement of *"I think there is no problem not knowing about food containing nitrosamines"*. The present data shows a lower percentage compared to the estimated result. This may be due to the unfamiliarity among respondents regarding food containing nitrosamine. They are mostly unaware of non-communicable disease that was closely related to high consumption of food containing nitrosamine. Moreover, almost half of the respondents have no opinion regarding Asian style food is the major contributor of cancer development. Asian-style food which rich in preservative meat is the main source of nitrosamine in the diet. It is in line with the previous study by Jakszyn and Gonzalez, (2006) that mentioned the Asian diet mostly high in nitrosamine compared to western food. In addition, nearly half of the respondents believed that fruits and vegetables are important to be included in the diet as they help in inhibit nitrosamine formation. Although they might not know regarding food containing nitrosamine, they acknowledge the benefits of consuming fruits and vegetables in their daily intake.

Furthermore, majority of the respondents agree to minimize the intake of food high in nitrosamine. This may be due to they believe this helps in reducing cancer risk. Most of them also agree to take an initiative to learn new knowledge regarding nitrosamine and cancer development. Knowledge on a disease helps to change the attitude of the people. According to Rose & Ayad (2008), the findings showed knowledge can improve the attitude of the students regarding the subjects. However, changes in attitude might be associated with other factors such as family background and economic status. A positive attitude can be seen from the respondents as they gain interest in learning this issue. Unfortunately, the overall positive attitude of the respondents were at a poor level.

Practice

Most of the respondents have highly consumed food containing nitrosamine. Almost all of the respondents had consumed food containing nitrosamine from various sources such as preserved fish, pickled food and processed meat. Besides that, most of the respondents frequently consume it once in a week. From the finding, it shows that most of them eventually practice the consumption of this diet which may contribute to

the risk of cancer. If continue to be taken in large amount as mentioned by Ward et al., (2000), the increasing number of consumptions of salted fish and preserved foods increase the nasopharyngeal carcinoma. This is due to the high level of nitrosamines content in those kinds of food. Moreover, it is mentioned in other study by Chang & Adami (2006), preserved food such as meats, eggs, fruits and vegetables elevate the risk of nasopharyngeal cancer. It was confirmed by using sensitivity analysis, there were relationships between dietary nitrate, nitrites and NDMA consumption with gastric cancer (Song, Wu and Guan, 2015). However, this study did not assess the exact amount of nitrosamine level for the practice. In the future, in order to access the acceptable level of nitrosamine in food, the researcher needs to identify the safe level of nitrosamine intake to the body.

The relationship between knowledge, attitude and practice regarding food high in nitrosamine and its association with cancer

The findings show that there was a significant correlation between knowledge and attitude regarding food high in nitrosamine and its association with cancer. Higher knowledge regarding this issue may influence the attitude of a person. People with better knowledge might be interested in altering the dietary pattern to the best. This is similar to the study done by Hearty, Mccarthy, Kearny & Gibney (2007) that claimed most of their respondents have a positive attitude or motivation in improving a healthy lifestyle. Furthermore, it was also reported by Zu & Xie (2015), the result of their study showed that after being introduced with the knowledge regarding the topic, it was reported in attitude changes of their respondents. The result indicates that compared with the benefit and mixed information, risk information has a greater and longer-lasting impact on attitude change. The moderating effect of knowledge on attitude change may result from these participants' better understanding of and greater trust in the information. In the context of this study, the knowledge did influence the attitude of a person, thus, it is necessary to conduct more interventions to improve the knowledge and develop an educational model for a better understanding of food containing nitrosamine as a risk of cancer.

Another finding of this study is there is no significant correlation between knowledge and practice regarding food high in nitrosamine and its association with cancer. Although, level of knowledge might not influence the consumption of food high in nitrosamine, but it must be monitored frequently. This is due to the relation between meat and processed meat intake with gastric cancer and esophageal cancer risk. Furthermore, preserved fish and preserved vegetables also show positive effects towards gastric cancer (Jakszyn & Gonzalez., 2006). The possible reason that can be deduced is the subject are keen to consume preserved food as it is affordable and

accessible. Although there is no connection between knowledge and practice, still, knowledge on this issue is crucial to ensure that users are aware of the pros and cons of practicing this dietary habit and knowledge might encourage the user to choose a better diet style.

CONCLUSION

The study on KAP regarding food high in nitrosamine as a risk factor for the development of cancer among IIUM Kuantan undergraduate students revealed that majority (63.0%) of the students had moderate knowledge regarding food containing nitrosamine and the effects to the body. Apart from that, this study revealed that students have a poor level of attitude ($\bar{x}$ = 2.68) towards food containing nitrosamine and health risk. However, the results show that high consumption of food containing nitrosamine among students (51.9%). Lastly, there was a significant correlation between knowledge and attitude regarding food high in nitrosamine as a risk factor for the development of cancer. Besides, it was found that there was no significant correlation between knowledge and practice regarding food high in nitrosamine as a risk factor for the development of cancer.

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REFERENCES

Chang, E. T., & Adami, H. O. (2006). The enigmatic epidemiology of nasopharyngeal carcinoma. Cancer Epidemiology, Biomarkers and Prevention, 1765-1777. Available from https://doi.org/10.1158/1055-9965.

Dietrich, M., Block, G., Pogoda, J. M., Buffler, P., Hecht, S., & -Martin, S. P. (2005). A review: dietary and endogenously formed N-nitroso compounds and risk of childhood brain tumors. Cancer Causes & Control, 16(6), 619–635. doi: 10.1007/s10552-005-0168-y

Dubrow, R., Darefsky, A. S., Park, Y., Mayne, S. T., Moore, S. C., Kilfoy, B., Ward, M. H. (2010). Dietary Components Related to N-Nitroso Compound Formation: A

Prospective Study of Adult Glioma. Cancer Epidemiology Biomarkers & Prevention, 19(7), 1709–1722. doi: 10.1158/1055-9965.epi-10-0225

Grosse, Y., Baan, R., Straif, K., Secretan, B., Ghissassi, F. E., & Cogliano, V. (2006). Carcinogenicity of nitrate, nitrite, and cyanobacterial peptide toxins. The Lancet Oncology, 7(8), 628–629. doi: 10.1016/s1470-2045(06)70789-6

Hearty, Á, Mccarthy, S., Kearney, J., & Gibney, M. (2007). Relationship between attitudes towards healthy eating and dietary behaviour, lifestyle and demographic factors in a representative sample of Irish adults. Appetite, 48(1), 1-11. doi:10.1016/j.appet.2006.03.329

Jakszyn, P & Gonzalez, C. A. (2006). Nitrosamine and related food intake and gastric and oesophageal cancer risk: A systematic review of the epidemiological evidence. World Journal of Gastroenterology, 12(27), 4296. doi: 10.3748/ wjg.v12.i27.4296

Key, T. J., r Schatzkin, A., Willet, W. C., Allen, N. E., Spencer, E. A., & Travis, R. C. (2004). Diet, nutrition and the prevention of cancer. Public Health Nutrition, 7(1A), 187–200. doi: DOI: 10.1079/PHN2003588

Larsson, S. C., Bergkvist, L., & Wolk, A. (2006). Processed meat consumption, dietary nitrosamines and stomach cancer risk in a cohort of Swedish women. International Journal of Cancer, 119(4), 915–919. doi: 10.1002/ijc.21925

Loh, Y. H., Jakszyn, P., Luben, R. N., Mulligan, A. A., Mitrou, P. N., & Khaw, K.-T. (2011). N-nitroso compounds and cancer incidence: the European Prospective Investigation into Cancer and Nutrition (EPIC)–Norfolk Study. The American Journal of Clinical Nutrition, 93(5), 1053–1061. doi: 10.3945/ajcn.111.012377

Mastrangelo., et al (2016). Vitamin C against cancer. 4(1), 64-86. DOI: 10.5772/intechopen.68746. Retrieved from https://www.intechopen.com /books/vitamin-c/vitamin-c-against-cancer

Ohgaki, H. (2009). Epidemiology of Brain Tumors. Methods in Molecular Biology Cancer Epidemiology, 323–342. doi: 10.1007/978-1-60327-492-0_14

Pawloska, E., Szczepanska, J., Blasiak, J. (2019) Pro- and Antioxidant Effects of Vitamin C in Cancer in correspondence to Its Dietary and Pharmacological Concentrations, Oxidative Medicine and Cellular Longitivity, 18 ,doi.org/10.1155/2019/7286737. Retrieved from https://www.hindawi.com /journals/omcl/2019/7286737/

Rose, K., & Ayad, S. (2008). Factors Associated with Changes in Knowledge and Attitude towards Public Health Concepts among Chiropractic College Students Enrolled in a Community Health Class. Retrieved from https://www. ncbi.nlm.nih.gov/pmc/articles/PMC2585949/

Song, P., Wu, L., & Guan, W. (2015). Dietary Nitrates, Nitrites, and Nitrosamines Intake and the Risk of Gastric Cancer: A Meta-Analysis. Nutrients, 7(12), 9872–9895. doi: 10.3390/nu7125505

Song, P., Wu, L., & Guan, W. (2015). Dietary Nitrates, Nitrites, and Nitrosamines Intake and the Risk of Gastric Cancer: A Meta-Analysis. Nutrients, 7(12), 9872–9895. doi: 10.3390/nu7125505

Study on food link to cancer. (2004, August 6). The Star Online. Retrieved from https://www.thestar.com.my/news/nation/2004/08/06/study-on-food-link-to-cancer

Zheng, J., Stuff, J., Tang, H., Hassan, M. M., Daniel, C. R., & Li, D. (2018). Dietary N-nitroso compounds and risk of pancreatic cancer: results from a large case–control study. Carcinogenesis, 40(2), 254–262. doi: 10.1093/carcin/bgy169

Zhu, X., & Xie, X. (2015, February 18). Effects of Knowledge on Attitude Formation and Change Toward Genetically Modified Foods. Retrieved August 27, 2020, from https://onlinelibrary.wiley.com/doi/full/10.1111/risa.12319