



Short communication

Microwave oven safety: A food safety consumer survey in Malaysia



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ARTICLE INFO

Article history:

Received 27 November 2016

Received in revised form

19 April 2017

Accepted 19 May 2017

Available online 19 May 2017

Keywords:

Microwave oven safety

Reheating

Food safety

Consumer survey

ABSTRACT

Microwave oven is an indispensable tool in every household. However, the proper usage of the microwave ovens was neglected and thus, causing food safety concerns, especially microbiological hazard in microwaved heated food. Therefore, a survey was initiated to gauge the consumer's knowledge of microwave oven safety concerning the food safety of reheated food. A total of 29 survey questions was designed that covered 5 demographic questions and 24 others on the knowledge and practice of microwave oven safety and food safety attitude. The survey was blasted out to 329 respondents via email. Overall, 189 (57.4%) returned respondents demonstrated low level of knowledge of the microwave oven safety, which indicated improper education of the microwave oven despite knowing the norms on the microwave oven usage. In addition, consumers demonstrated low levels of practicing microwave oven safety. The outcome of the survey also showed consumer's neutral attitude towards food safety. There was no statistically significant association between the variables and demographic. The minimum knowledge of microwave oven and food safety shown by the consumers requires the attention to improve the food safety educational programs by including the knowledge on microwave oven safety for the betterment of the public health.

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1. Introduction

According to World Health Organization (WHO), food safety encompasses the actions aimed at ensuring that all food is as safe as possible (WHO, 2016). Food safety is the responsibility of every person involved in the food supply chain from farm to the end users in assuring the safety and quality of the food. It is a bridge of trust between the food manufacturers and food producers and their customers and this reliance is the core of their business. In Malaysia, food safety had risen to prominence when there were a few serious reported foodborne illness cases occurred lately. Two outbreaks were reported back-to-back at different states of Malaysia involving students. On October 3, 2016, 70 victims were rushed to the hospital after consumption of egg sandwich served in Kuala Terengganu, Terengganu. The second case happened in Bukit

Mertajam, Penang where 66 students contracted food poisoning on the same day (The Star, 2016). Both outbreaks were reported due to mishandling of food and improper food hygiene and sanitation.

The Malaysian's Food Safety and Quality Division (FoSIM) of the Ministry of Health has been distinctively playing its role in ensuring the food is against any related hazards and fraud to protect the public. Food safety policies and regulations were established to ensure the Malaysian community is protected. But then again, the one-sided effort is insufficient as food safety remains an ad-hoc issue. There is a necessity for the authorities to constantly create food safety awareness among the food handlers and consumers. As many food scientists and researchers are looking towards sustainable food for the World via exploring alternative food technologies, food safety must not be neglected. The public's mindset should be changed to understand about the importance of food safety enforcement for the better of food sustainability.

As food technology advances, the innovation of the microwave oven in the mid-20th century has made its significance in food preparation. Microwave oven becomes an indispensable tool due to

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its ability to reheat or cook food within minutes. The volumetric heat generation of microwave heating is the most important characteristic for rapid food reheating. The interaction of the food molecules with the microwaves will induce the molecular friction attributed to the breaking of hydrogen bond associated with water molecules and ionic migration of free salts in an electric field of rapidly changing polarity (Fu, 2006) which will be converted to heat. Thus, heat is generated throughout the food rapidly. The convenience of this electrical appliance is likely to be everyone's favourite choice in the kitchen. But what of its safety has become when improper or no knowledge is being taught to the consumers. The major concern with using microwave technology for food safety applications is the survival of foodborne pathogens, due to uneven heating, including surface cooling effects (FDA, 2015). Therefore, the aim of this study was to measure the Malaysian consumer's knowledge and practice of microwave oven safety emphasizing on food safety. This paper also discusses on the evaluation of Malaysian consumer's food safety attitude and concerns about microwaved foods. To the author's knowledge, this is the first food safety survey conducted that is related to microwave oven safety.

2. Materials and methods

2.1. Survey design

A grand total of twenty-nine questions were designed for this survey based on the available literature (United States Department of Agriculture (USDA) Food Safety and Inspection Service (FSIS), 2011) and suggested framework (Food Standards Australia New Zealand (FSANZ), 2008). The survey was divided into four sections, namely demographic (five questions); microwave oven – usage and knowledge (eight questions); microwave oven safety practice when reheating or cooking food (ten questions) and food safety attitude and concerns about microwaved food (six questions).

2.1.1. Demographic

Consumers were asked for their age; employment status; level of education; gender and the current residing location in the demographic section using multiple choice questions.

2.1.2. Microwave oven – usage and knowledge

Consumers were asked about the microwave oven and the safety usage of the microwave oven. The knowledge of the appliance as well as the safety instructions that need to be followed when using a microwave was evaluated in this section.

Out of the eight questions constructed, four questions specifically focused on the safety usage of microwave oven, which consisted of yes/no questions. Correct ones were given a point while no point was given for incorrect ones. The scores were then summed which varied from 0 to 4 points. The passing rate was set at 50% of the total points. Frequencies (counts and percentages) were calculated for each answer choice.

2.1.3. Microwave oven safety practice when reheating or cooking food

For this section, consumers were asked about their practices while using the microwave oven for reheating or cooking purpose. The questions asked, covered the time consumers used to reheat their food, the safety practice of reheating food using the microwave oven, their compliance to the food labelling instructions for reheating and cooking food using a microwave oven. Yes/no and open-ended questions were used in this section.

Three questions in this section were specifically used to

measure the frequencies of consumers practicing microwave oven safety during reheating of food. Correct ones were given a point while no point was given for incorrect ones. The sum of the scores varied between 0 and 3 points. If respondents could answer half of the questions correctly, it is indicated that they passed. Frequencies (counts and percentages) were calculated for each answer choice.

2.1.4. Food safety attitude and concerns about microwaved food

In this section, consumers were asked about food safety and their concerns about microwaved food using 3 – point Likert scale; 5 – point Likert scale; rating; and multiple choice questions. Likert scale questions were specifically used to measure the food safety attitude of the consumers. Points were given according to the Likert-Scale, meaning for 3 – point scale, points ranged from 1 to 3 while for the 5 – point scale, points ranged from 1 to 5. The maximum score for this section was 16 points. The accumulated scores were then grouped according to the following three levels: 0–8 negative attitude; 9–11 neutral attitude; and 12–16 positive attitude. Respondents were also asked to rate their perception on the safety of eating microwaved food using a scale of 1 (extremely unsafe) to 9 (extremely safe) and the mean score was calculated.

2.2. Data collection

An online survey system (Survey Monkey) was used. The survey was sent to 329 consumers, targeting working adults all around Malaysia and invited through email which contain the link to direct the consumers to the survey. A pre-test survey was conducted, covering 30 respondents to evaluate on the suitability and language. The fieldwork began between May 2016 to August 2016. Among the 329 respondents, 189 of responded constituting a response rate of 57.4%. The completed questionnaires were coded and recorded by the online survey system.

2.3. Data analysis

Statistical Package for the Social Sciences (SPSS) Version 24 (IBM, United States of America (USA)) were used to analyse the data. Chi-square test and Monte Carlo simulation were employed to test for independence between the variables. Chi-square test for larger contingency tables will be valid following the terms: 1. At least 80% of the expected frequencies exceeds 5; and 2. All the expected frequencies exceed 1. If both terms are non-compliant, Monte Carlo simulation will be used based on 95% confidence interval. Findings with a p-value of less than 0.05 was considered statistically significant. Phi and Cramer's V test were used to test the strength of the association.

3. Results and discussion

3.1. Demographic

The demographic results of the survey were summarized in Table 1. The consumer group was targeted to be mostly working adults as it was assumed that working adults will be using the microwave oven regularly. A total of 121 (64.0%) of the consumers is employed and working full time. There were more female consumers (73.0%, 138) compared to the male consumers (27.0%, 51). The demographic results indicated a diversity of consumers from different states with Kuala Lumpur topping at 48.7% (92), followed by Selangor at 33.9% (64). Most of the consumers had completed their Bachelor's degree where there was a total of 128 of them (67.7%).

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