

Pakistan Journal of Nutrition 11 (2): 110-115, 2012
ISSN 1680-5194
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Knowledge and Practices on Food Safety among Secondary School Students in Johor Bahru, Johor, Malaysia

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Abstract: The issue of food safety is an issue that is discussed widely, but cases of food poisoning in particular, are still continuing. This may be associated with their own level of knowledge and practices on food safety. This study was aimed to examine the level of food safety knowledge and practices from two secondary school students, to investigate the association between food safety knowledge and practices with gender, to identify the correlation between food safety knowledge levels with practices and to compare the difference of knowledge and practices level between both of the school. Information concerning demographic, food safety knowledge and practices were collected using self-administered questionnaire. 339 students comprising 202 male and 197 female from two schools were randomly selected to answer the questionnaire provided. Analyzed data obtained stated that knowledge on food safety was good for both school and their also practiced on food safety by 79.1% included in good practice range. Results also showed that a high level of food safety knowledge and practices was possessed by both groups, male and female students in quite similar value of means. Correlation between food safety knowledge and practices on food safety indicated, there was a small positive correlation with [$r = 0.148$, $n = 221$, $p < 0.05$] for Sekolah Tinggi Arab Maahad and [$r = 0.053$, $n = 178$, $p < 0.5$] for Sekolah Menengah Kebangsaan Gelang Patah.

Key words: Food safety, knowledge, attitude, practices, school children

INTRODUCTION

Food safety is an increasingly important public health issue since years ago until now. Increasingly cases that involved on consume unhealthy food becoming more severe, not only implicate the public, but more worrying rise among school children even though various efforts have done by the authorities. Perhaps, still many more who did not realized the importance of knowledge about food safety. According to Food and Agriculture Organization (FAO), food safety is definite as the degree of confidence that food will not cause sickness or harm to the consumer when it is prepared, served and eaten according to its intended use (WHO, 2003). However, food illnesses are defined as diseases, usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food (WHO, 2007). Every person has a risk of food illnesses but may vary in term of risk level either low or high. Those who have low knowledge on food safety have high tendency to contracting with any food illnesses.

The entire world statistics on food borne outbreak showed that the cases of food borne illnesses increasing year by year. In United State, estimation for food borne disease is may result in 76 million illnesses, 325,000 hospitalization and 5000 deaths each year

(Mead *et al.*, 1999) while in England and Wales, food borne diseases resulted in an estimated of 1.3 million cases, 21,000 hospitalizations and 500 deaths yearly (Adak *et al.*, 2002). However in Malaysia condition, food borne diseases in 2009 were low which is 0.14 cases per 100,000 population, but in term of food poisoning cases is on the rise as proven by the incidence rate of 62.47 and 36.17 per 100,000 population in 2008 and 2009 respectively (MOH, 2009; 2010). Food poisoning cases usually reported among school student that involved in school canteens, hostel kitchens and food prepared under the Supplementary Food Programme. The contributing factors in these outbreaks of food poisoning are improper storage or holding temperature and poor personal hygiene (Khor *et al.*, 1998). Recent studies showed that level of food safety knowledge associated with the socio-demographic and academic variable (Osaili *et al.*, 2010) by increased food safety knowledge with age. Observation on food safety knowledge and practices between male and female showed, female have higher practices on food preparation compared to male but in term of knowledge, male and female are in the same level (Sanlier, 2010). Knowledge of food safety is very important among the students because they are also customers. The

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prevention of food borne illnesses requires educating food consumers on safe food handling practices (Jevsnik *et al.*, 2008). Education must be providing to increase the level of knowledge. Regarding to Theo, many food borne illnesses have their origin in the household kitchen and it is at this level that the most effective controls can be apply. This emphasizes the importance of consumer education and of the communication of information on emerging food borne hazards to consumers (Theo van de Venter, 2000). Knowledge on food safety among school students should be developing in the early stage of age because they are the future food handlers.

MATERIAL AND METHODS

Research design: A cross-sectional study was conducted from January to November 2011 on food safety knowledge and practices of upper secondary school students in age range 16 to 19 years old in Johor Bahru area. Two schools, Sekolah Tinggi Arab Maahad which having an experience on food poisoning while Sekolah Menengah Kebangsaan Gelang Patah with no cases of food poisoning reported were selected.

Instrumentation: The research data was collected through a self-administrated questionnaire that divided into three sections which are demographic, food safety knowledge (10 questions) and food safety practices section (10 questions). All these questions were a modified from the previous studies (Osaili *et al.*, 2010; Sanlier, 2010; Mohd *et al.*, 2009).

For food safety knowledge questions, answers were graded by giving 1 point for the right answers and 0 point for the incorrect answers. Score for this part vary from 0 to 21 and the highest score is meant the highest level of knowledge whereas for food safety practices were graded as follows: 'almost never', 1 point, 'sometimes', 2 points, 'often', 3 points and 'always', 4 points. However, for negative questions, the grade was been assigned in a reverse order. Scores regarding food safety practices vary from 21 to 38.

Pilot study: The questionnaire was pilot tested by 15 respondents in a secondary school in Kluang area during April 2011 to confirm question reliability and validity.

Data collection: 450 sets of questionnaires were distributed, but only 399 sets have been collected back (221 respondents from Maahad and 178 respondents from SMK Gelang Patah). The researcher has asked the help of some classroom teachers to distribute the survey forms to their students randomly and the survey forms were returned after the end of class period. Each of survey forms received was marked with identification numbers.

Statistical analysis: Data gathered were analyzed by using the Statistical Package Social Sciences, Version 17.0. Descriptive statistical (means, percentages, standard deviations and frequencies) were used for all variables. In addition, in terms of the association between gender and the level of food safety knowledge and practices and also to compare knowledge level and practices between two schools, independent t-test has been used. Bivariate correlation analysis was used to determine the correlation between knowledge level and practices.

Table 1: Demographic characteristics of respondents

| Demographic characteristics | Number of respondent | % |
|--------------------------------|----------------------|------|
| Gender (n = 399) | | |
| Male | 202 | 50.6 |
| Female | 197 | 49.4 |
| School | | |
| Sekolah Tinggi Arab Maahad | 221 | 55.4 |
| Sekolah Men. Keb. Gelang Patah | 178 | 44.6 |
| Age group (n = 399) | | |
| 16 | 146 | 36.6 |
| 17 | 17 | 4.3 |
| 18 | 201 | 50.4 |
| 19 | 35 | 8.8 |

RESULTS

Profile of respondent: Analyzable questionnaires were obtained from 339 upper secondary school students of two schools. Demographic characteristics of survey respondents are listed in Table 1. 55.4% (221) respondents are coming from Sekolah Tinggi Arab Maahad while the rest, 178 are from Sekolah Menengah Kebangsaan Gelang Patah (44.6%). Percentages of male and female respondents were almost closer about 50.6% (202) and 49.4% (197) respectively. The majorities of respondents were aged 18 of a total of 50.4% (201) and followed by those who aged 16, around 36.6% (146). Results also showed that, percentage of respondent in low-income family and high income family is same about 37% while only 25.9% of respondent came from moderate family.

Food safety knowledge level: To determine the level of food safety knowledge, scoring for each question is made and the total score obtained is between 0-21. For the overall percentages comprised both schools, this study found that, the respondents have a good knowledge on food safety which is about 88.7% (354) and only 0.3% respondents take in poor level of knowledge. The rest percentages included in range 21 to 15 which is in excellent level of knowledge is about 11%. Table 2 showed the percentages of correct responses for the whole questionnaire in food safety knowledge section. In addition, this study also indicated that there was no significant difference in the level of food safety knowledge between male and female respondents based on p-value obtained more than 0.05. Mean and Standard Deviation (SD) for food safety

Table 2: Responses to food safety knowledge questions (N = 399)

| Questions | Correct answers (%) (n ^a) | Incorrect answers (%) (n ^a) |
|--|---------------------------------------|---|
| 1. Do you know, you should always wash your hands after coughing or sneezing? Yes; No | 92.0 (367) | 8.0 (32) |
| 2. To determine the safety of milk, you should taste it first as well just look at the expiry date only. Yes; No | 62.4 (249) | 37.6 (150) |
| 3. Is it an offense to eat canned food that has been bloated? Yes; No | 89.7 (358) | 10.3 (41) |
| 4. Do not place the chicken, fish and raw meat at the same place. Yes; No | 52.1 (208) | 47.9 (191) |
| 5. Is it enough just by washing your hands under running water to remove bacteria before touching food? Yes; No | 78.2 (312) | 21.8 (87) |
| 6. The best way to avoid food poisoning from fruits and vegetables is to wash them under running water. Yes; No | 82.2 (328) | 17.8 (71) |
| 7. To avoid food poisoning, you should clean the kitchen sink drain every week. Yes; No | 55.4 (221) | 44.6 (178) |
| 8. Which foods do not cause food poisoning? Leftover chicken eaten cold: Yes; No | 55.4 (221) | 44.6 (178) |
| Food is exposed without cover: Yes; No | 20.6 (82) | 79.4 (317)* |
| Rice left overnight in the kitchen: Yes; No | 33.3 (133) | 66.7 (266) |
| Chocolate cake that was left overnight in the kitchen: Yes; No | 41.6 (166) | 58.4 (233) |
| 9. Which foods will increase one's risk of suffering food poisoning? Soft scramble eggs: Yes; No | 13.5 (54) | 86.5 (345)* |
| Fresh milk: Yes; No | 10.8 (43) | 89.2 (356)* |
| A slice of melon: Yes; No | 4.5 (18) | 95.5 (381)* |
| Half-boiled eggs: Yes; No | 10.3 (41) | 89.7 (358)* |
| Unpasteurized milk: Yes; No | 74.7 (298) | 25.3 (101) |
| Raw seafood or undercooked seafood: Yes; No | 73.4 (293) | 26.6 (106) |
| Undercooked meat and chicken: Yes; No | 77.4 (309) | 22.6 (90) |
| Dry food stored in the cabinet near the oven: Yes; No | 45.1 (180) | 54.9 (219) |
| Canned vegetable consumed without prior heating: Yes; No | 73.9 (295) | 26.1 (104) |
| 10. Salmonella bacteria can cause food poisoning. Correct; Incorrect | 56.6 (226) | 43.4 (173) |

*Highest percentage and number of respondents that answered question incorrectly.

n^a = number of respondent, N = number of total respondent

knowledge among male is quite closer with mean for female which is 12.12±1.900 and 12.28±1.925 respectively. The magnitude of the differences in the means was very small (eta squared = 0.002).

Food safety practices level: Overall, majority of respondent have high level of practices on food safety with mean and SD 31.15±3.316 respectively that involved 71.9% with around 287 of respondents. Only 28.1% of respondents are moderately practiced on food safety daily life. Otherwise, food safety practices of female and male respondents are presented in Table 3. There is not a statistically significant difference in the mean food safety practices for males and females. (Based on Sig 2 tailed is more than 0.05). 80.7% of female respondents and 64.4% of male respondents state that they always washed their hand before eating or preparing food at home. Besides, they also express that they wash their hand before eating food in the school canteen or restaurant with close percentages, 67.3% for male and 65.0% for female. Additionally, both of groups also have high concern level on food preparation and food condition with 68.8% of male and 75.1% of female always avoid rare meat and only eat meat after cooked well.

Comparison of food safety knowledge and practices between two schools: The relationship between food safety knowledge and food safety practices was investigated using Pearson product-moment correlation

coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. For Sekolah Tinggi Maahad, there was a small, positive correlation between the two variables [$r = 0.148$, $n = 221$, $p < 0.05$] (Table 4). There is not much overlap between the two variables because it is have small coefficient of determination just only 2.19%. However, for Sekolah Menengah Kebangsaan Gelang Patah data showed that, there was a very small, positive correlation between the food safety knowledge and food safety practices among respondent responses [$r = 0.053$, $n = 178$, $p < 0.05$] (Table 5). The average of the food safety knowledge scores of Sekolah Tinggi Arab Maahad was calculated as 12.81±1.945 while for Sekolah Menengah Kebangsaan Gelang Patah obtained 11.46±1.580 (Table 6). There was found that, knowledge score of respondents from Sekolah Tinggi Arab Maahad is higher than Sekolah Menengah Kebangsaan Gelang Patah and relationship between them is significant ($p < 0.001$). However, in term of practices on food safety scores, Sekolah Menengah Kebangsaan Gelang Patah showed that they similar average with Sekolah Tinggi Arab Maahad, which is 31.2±3.466 and 31.1±3.197 respectively.

DISCUSSION

Study involving school children on food safety has yet more to be made. Many studies have been completed among university students, young, adult and others. As known, students are consumer and also a future food

Table 3: Food safety practices of male and female respondent

| Practices | Almost never (%) | Sometimes (%) | Often (%) | Always (%) |
|--|------------------|---------------|-----------|------------|
| I always ensure purchasing food that is clean and in fresh condition. | | | | |
| Male | 1.0 | 6.4 | 26.2 | 66.3 |
| Female | 0.5 | 10.2 | 17.8 | 71.6 |
| I wash my hands before preparing and eating food at home. | | | | |
| Male | 0.0 | 8.4 | 26.7 | 64.4 |
| Female | 0.0 | 4.6 | 14.7 | 80.7 |
| I wash my hands before eating food in the school canteen/restaurant. | | | | |
| Male | 0.5 | 7.9 | 23.8 | 67.3 |
| Female | 0.5 | 14.2 | 19.8 | 65.0 |
| I check the expiry date on the food packages before purchase. | | | | |
| Male | 1.5 | 15.3 | 26.2 | 56.4 |
| Female | 1 | 14.7 | 24.9 | 58.9 |
| I do not eat raw or uncooked eggs and foods made from raw eggs. | | | | |
| Male | 18.8 | 47.5 | 18.3 | 15.3 |
| Female | 18.3 | 40.6 | 15.7 | 25.4 |
| I put the easy-to-spoil foods into the refrigerator as soon as I buy them. | | | | |
| Male | 16.8 | 14.9 | 29.7 | 38.6 |
| Female | 12.2 | 16.2 | 19.8 | 51.8 |
| I taste food to see if it is safe or not. | | | | |
| Male | 17.3 | 26.2 | 27.7 | 28.2 |
| Female | 14.2 | 35.0 | 22.3 | 27.9 |
| I dry my hands with paper towel or tissue after washed it. | | | | |
| Male | 5.0 | 26.2 | 31.7 | 37.1 |
| Female | 4.1 | 32.5 | 32.5 | 31.0 |
| I eat meat after cooked well, I do not consume rare meat. | | | | |
| Male | 4.5 | 3 | 21.3 | 68.8 |
| Female | 2.5 | 4.6 | 17.3 | 75.1 |
| For leftovers, I prefer to reheat it by using microwave oven. | | | | |
| Male | 22.8 | 25.7 | 22.8 | 28.7 |
| Female | 20.3 | 31.0 | 20.8 | 27.4 |

Table 4: Correlation between food safety knowledge and food safety practices level for SekolahTinggi Arab Maahad

Correlations between food knowledge level and practices

| | | Food safety knowledge | Food safety practices |
|-----------------------|---------------------|-----------------------|-----------------------|
| Food safety knowledge | Pearson correlation | 1 | 0.148* |
| | Sig. (2-tailed) | | 0.028 |
| | N | 221 | 221 |
| Food safety practices | Pearson correlation | 0.148* | 1 |
| | Sig. (2-tailed) | 0.028 | |
| | N | 221 | 221 |

*Correlation is significant at the 0.05 level (2-tailed)

Table 5: Correlation between food safety knowledge and food safety practices level for Sekolah Menengah Kebangsaan Gelangpatah

Correlations between food knowledge level and practices

| | | Food safety knowledge | Food safety practices |
|-----------------------|---------------------|-----------------------|-----------------------|
| Food safety knowledge | Pearson correlation | 1 | 0.053* |
| | Sig. (2-tailed) | | 0.486 |
| | N | 178 | 178 |
| Food safety practices | Pearson correlation | 0.053* | 1 |
| | Sig. (2-tailed) | 0.486 | |
| | N | 178 | 178 |

*Correlation is not significant difference when p = 0.053

Table 6: Food safety knowledge and food safety practices scores of Sekolah Tinggi Arab Maahad and Sekolah Menengah Kebangsaan Gelan Patah

| | SekolahTinggi Arab Maahad Mean±SD | SMK. Gelangpatah Mean±SD | t | P |
|-----------------------|--------------------------------------|-----------------------------|--------|--------|
| Food safety knowledge | 12.81±1.945 | 11.46±1.580 | 7.650 | 0.000* |
| Food safety practices | 31.10±3.197 | 31.20±3.466 | -0.294 | 0.769 |

*Mean is significant if p<0.01

handler, so they need to make improvement on their own self toward food safety knowledge field because knowledge is associated with current practices. However, a study was revealed that, awareness of the danger of improperly cooked, knowledge of specific food borne pathogens and knowledge of food safety practices had no effect on willingness to change behavior (McIntosh *et al.*, 1994). Nevertheless, in the same study tell, the respondents who were better-educated, female and respondents who used newspapers/magazines or televisions were all more likely to report willingness to change their cooking practices. Other studies have been made among school student in Seoul and Ulsan toward identify food safety knowledge and results were exposed that, 91.9 percent of the respondents did not know what unsanitary food is. 67 percent of the respondents did not know the proper method of hand washing. Although the students' level of knowledge and behavior associated with food safety was low there was meaningful correlation ($r = 0.184$, $p < 0.01$) between knowledge and behavior (Yoon and Yoon, 2007).

Seldom, gender differences, male and female have varied level of knowledge about food safety and these differences have affected the food practices. According to Meer and Misner (2000), study indicated that women scored significantly better than men on food safety knowledge and practice test parameters. Another result in difference study also showed, one-third of the respondents who prepared meals reported unsafe food hygiene practices: e.g., they did not wash hands or take precautions to prevent cross-contamination from raw meat. Unsafe practices were reported more often by men, adults 18 to 29 years of age and occasional food preparers than by women (Altekruse *et al.*, 1996). An another study towards investigated on food safety knowledge had been done among Taif University students, Saudi Arabia where the respondents were divided to three main groups which are "Male and health", "Male and humanities" and "Female and humanities". In this study showed that, there was a significant difference between the mean percentage score for knowledge, attitude, practice and overall KAP in the three major students: "males and health"; "male and humanity" and "female and humanity" (Sharif and Al-Malki 2010). Even though, results obtained from previous studies is different from the results in this study. In this study has showing that, no significant difference between female and male respondent on food safety knowledge and practices. Perhaps, the awareness toward food safety among male was increased.

According to this study finding on a food borne pathogen Salmonella, 44.4% of respondents approximately who did not know that Salmonella can cause food illnesses. Salmonella is the pathogen involved in most outbreaks of food borne illness in around the world no exception to

Malaysia. Salmonella also was the pathogen involved in most outbreaks of food borne illness in Slovenia, especially with food prepared at home (IVZ, 2005). Based on Osaili *et al.* (2010), proportion of participants who identified food vehicle associated with transmission of Salmonella was greater than those who identified food vehicle associated with the other food borne pathogens. Other study also found that Salmonella was greater dangerous than other pathogens in term of food vehicle for transmission (Garayoa *et al.*, 2005).

Relationship between food safety knowledge and food safety practices in this study showed that food safety practices have a small influenced by food safety knowledge. However, in similar study stated, best practices and knowledge mean scores declined significantly as self-rated food safety skill and self-rated food safety knowledge levels declined, respectively (Byrd-bredbenner *et al.*, 2007). Another study on food safety attitude of culinary arts based students in public and private higher learning institutions (IPT) was revealed, two out of four dimension (avoid cross contamination and avoid food unsafe sources) included of food safety knowledge having significant influences on food safety attitude, $p = 0.00$ and $p = 0.01$ respectively (Mohd *et al.*, 2009). Future study should focus more on correlation between knowledge levels with practices on food safety.

Sekolah Tinggi Arab Maahad has experienced on food poisoning while Sekolah Menengah Kebangsaan Gelang Patah has not. So, comparisons have been done on the knowledge of food safety and practices for both of the schools. Result showed that, Sekolah Tinggi Arab Maahad have higher means of knowledge compared with the means of Sekolah Menengah Kebangsaan Gelang Patah. However, the paractices on food safety for both schools are quite similar. It is maybe because Sekolah Tinggi Arab Maahad has made some educational programme in order to increase the awareness on food safety among their students and indirectly help prevent food poisoning occurring in the future.

This study was involved only two secondary school which are Sekolah Agama Tinggi Maahad and Sekolah Menengah Kebangsaan Gelang Patah, Johor Bahru, Johor, therefore the result was not been represented to all secondary school population in the entire district. Involvement from others school in the same area should be consider for the future research. Other than that, by using self-administrated questionnaires to obtain data may cause occurrence of bias by the respondents. Consequently, varieties of data collection techniques are needed to upkeep the accuracy and precise of the study.

Conclusion: The findings in this study are hoped offered some insights to the authorities to continuously increase

the educational program on food safety field in order to increase the awareness of students and understand the continuous occurrence of food borne illness through lack of positive practices in personal hygiene. All differences in this study hoped were taken seriously and do some research about how is the better way to increase the awareness.

ACKNOWLEDGEMENT

This research was supported financially by Universiti Teknologi MARA through the Excellent Fund grant with number 600-RMI/ST/DANA 5/3/Dst (169/2011). The authors appreciatively acknowledge the support and help of the classmate, Nor Munirah Mohamad Yusof and also to the staff, teachers and students of both schools who have given full cooperation.

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