

Genevieve Eleanor Ruby,<sup>1\*</sup> Ungku Fatimah Ungku Zainal Abidin,<sup>1</sup>  
 Samuel Lihan,<sup>2</sup> Nuzul Noorahya Jambari<sup>3</sup> and Son Radu<sup>3,4</sup>

<sup>1</sup>Dept. of Food Service and Management, Faculty of Food Science and Technology, Universiti Putra Malaysia, Serdang, Selangor, Malaysia

<sup>2</sup>Dept. of Molecular Biology, Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, Kota Samarahan, Sarawak, Malaysia

<sup>3</sup>Dept. of Food Science, Faculty of Food Science and Technology, Universiti Putra Malaysia, Serdang, Selangor, Malaysia

<sup>4</sup>Food Safety and Food Integrity, Institute of Tropical Agriculture and Food Security, Universiti Putra Malaysia, Serdang, Selangor, Malaysia



## Self-reported Food Safety Practices Among Adult Consumers in Sibul, Malaysia: A Cross-sectional Study

### ABSTRACT

This research investigated consumers' self-reported food safety practices, along with their determinants. The cross-sectional survey employed a questionnaire comprised of 16 items to gather data pertaining to food safety practices among consumers in Sibul located at Sarawak. Of the 800 disseminated questionnaires, a total of 623 were completed and returned. We discovered that respondents performed some of the food safety practices poorly; for example, 94.4% of the respondents failed to utilize a thermometer to determine the doneness of cooked meat. In addition, levels of self-reported food safety practices seemed to differ with certain variables, particularly gender ( $P < 0.05$ ), education level ( $P < 0.05$ ), number of children in the family ( $P < 0.05$ ), and frequency with which food was prepared by the respondent at home ( $P < 0.05$ ). The binary logistic regression modeling method of analysis revealed that female respondents displayed better food handling practices (OR = 21.82; 95% CI: 11.12, 42.81) than males. The results highlight that self-reported food safety practices do play a major

role in controlling foodborne diseases (FBDs) by placing the focus on food handling practices in the home. Hence, education concerning food safety must be extended to the entire society.

### INTRODUCTION

Foods contaminated with pathogens cause foodborne diseases (FBDs) that may lead to illness or even death. Specifically, in Malaysia, cholera, dysentery, food poisoning, Hepatitis A, and typhoid fever have been categorized as food- and waterborne diseases that are flagged under the Prevention and Control of Infectious Diseases Act 1988 (Act 342) (58). The major contributor to FBDs was non-compliance with food handling guidelines because of lack of consumer awareness regarding food safety practices (81, 90).

Consumers are thus advised to adhere to the steps in safe food handling at home in order to minimize FBD transmission, as pathogens have been detected in the home environment. A microbiological analysis carried out in homes detected *Enterobacteriaceae* spp., *Staphylococcus*, *Listeria* spp., and *E. coli* in abundance in the kitchen, more than in other parts of the

\*Author for correspondence: Phone: +1 6013.8485081; Email: genevieveleanor@gmail.com

home (9, 17, 41, 59). Transmission of pathogens can be effectively controlled if consumers prioritize personal hygiene, including hand hygiene, personal attire, cleaning habits, and health status, during food preparation to ensure food safety and healthier consumers (10, 57, 82).

Nevertheless, it has been reported that many consumers neither washed their hands before and after preparing food nor used an apron. In fact, only a small proportion of consumers trimmed their fingernails regularly, despite the fact that long fingernails promote the transmission of pathogens into food (29). Furthermore, improper food handling practices at home, such as improper cooking methods and storage, cross-contamination, and temperature abuse, have been identified as factors that contribute to outbreaks of FBDs (7, 36, 46, 86, 104).

FBD cases appear to be prevalent in Sarawak, Malaysia. In 2014, up to October, a total of 1,017 food poisoning cases were reported in Sarawak (16), compared with 805 cases in 2010 (65). Additionally, 9 cases of typhoid fever were reported in Belaga, Kapit division, Sarawak. However, no deaths were reported as being caused by this disease which is due to infection with *Salmonella* Typhi (14). In Sibü, a district in Sarawak that is strategically located in the central region and known for its rapid growth (87), a demographic shift has put consumers at risk for disease outbreaks, including FBDs, as a result of changes in eating habits that do not follow microbiological safety procedures (86). These habits include consuming raw or only partially cooked food, unhygienic processes in food preparation, and improper storage of raw and cooked foods. Exposure of foods that are consumed daily to pathogens also led to FBDs. Sliced tropical fruits, water, and poultry were among the common sources identified for *S. Typhi* contamination (48, 54, 67, 71, 74). *Vibrio* species emerged as the most abundant microorganisms isolated from the feces of cholera patients; these organisms had been transmitted from various sources, including seafood and drinking water (13, 24, 68, 75). Similarly, the presence of *Bacillus cereus* in ready-to-eat foods, including important crops in Sarawak such as local rice and sago, appeared to contribute to food poisoning (40, 49, 50, 51, 83).

Based on this evidence, it is clear that most of the common foods consumed in Malaysia are contaminated with a variety of pathogens that increase the risk of infection with FBDs and that FBDs are preventable if consumers, who are the end users in the food supply chain, adhere to food safety practice guidelines when handling food at home. Therefore, a survey of self-reported food safety practices can provide baseline data for exploring how often consumers use appropriate food safety handling measures and for concurrently assessing their level of mastery of food safety information.

The foregoing discussion highlights the importance of consumers using hygienic practices in the course of handling food so as to minimize the risks of FBDs. In the Malaysian context, abundant studies have examined the food safety

practices of students (61, 69), abattoir workers (2), and food handlers at canteens, food courts or restaurants (3, 38, 60, 79, 89), as well as street vendors who sell food (26, 76). Unlike consumers, commercial food handlers are required to attend food safety courses, as stated in the Food Act 1983 and Food Hygiene Regulations 2009 enforced by the Food Safety and Quality Division (FSQD) (28, 56, 97). Food handlers are also constantly monitored by the authorities to ensure that they comply with regulations 30, 31 and 32 of the Food Hygiene Regulations 2009 (Act 281).

In addition, with regard to fresh food, abattoir workers are required to ensure that their premises and the surrounding areas continuously maintain hygienic and pollution-free conditions. For purposes of monitoring, it is compulsory that an abattoir be registered with the ministry, as stipulated in the Abattoirs (Privatization) Act 1993 (22). Therefore, it is clear that commercial food handlers and abattoir workers probably practice better food safety practices than consumers, because of consistent monitoring by the authorities.

To the best of the authors' knowledge, only a few studies have investigated food safety as related to preparation of food on a regular basis at home (52, 63), and no formal educational program exposes consumers to food safety practices in East Malaysia. Therefore, this study focused on the self-reported food safety practices of Sarawakian consumers and investigated the links among these practices and socio-demographic profiles, frequency of preparing food, and the number of persons in the family.

## MATERIALS AND METHODS

### Research design

The cross-sectional survey approach was used to determine the level of self-reported food safety practices among a group of adult consumers in the area of Sibü. This particular approach was selected because it reaches more respondents, can yield more accurate responses, and appears to be the method most frequently used to gather data pertaining to food safety practices (33, 77, 88).

### Samples

The respondents in this study were selected randomly from the 6 main shopping centers in Sibü, as listed by Wikipedia contributors (103). The researchers placed themselves at the entrance of supermarkets and stores that offered discounts, where they distributed the questionnaires, because the entrance of such stores attracts the visitors who were the potential respondents (100). The method of approaching respondents was as follows: after they completed their shopping, the survey was conducted, at various times of day, so as to minimize sampling bias (37, 94). Before the survey was begun, the purpose of the study was clearly explained to the respondents by the researcher; hence respondents participated on a voluntary basis.

The questionnaires were collected immediately after completion by respondents, within approximately 15 to 20 minutes. This procedure was repeated until a maximum of 134 consumers had been questioned in each shopping center, resulting in a total of 800 consumers, which exceeded the sample size of 103 calculated by G\*Power software as necessary to avoid attrition bias.

Of the 800 questionnaires distributed, 623 were completed and returned. This number appeared to be similar to that reported in several prior survey studies (8, 72). The criteria applied to select the respondents in this study were: male and female, aged 20 years old and above, who prepared food for their families. Professional food handlers were excluded.

### Design of questionnaire

The randomly selected respondents completed a questionnaire that had been modified from one used in previous studies (34, 52). The questionnaire was translated to the Malay language and was used in a pilot study with 30 respondents who were not involved in the actual study. Slight modifications were made based on comments from the pilot study respondents before the questionnaire was adopted for the actual study. The questionnaire was comprised of two sections: socio-demographic profiles and items that reflected self-reported food safety practices.

The first section extracted data on gender, age, education level, employment status, number of people in their households, number of children, and frequency of preparing food at home.

In the second section, significant aspects of food handling practices were assessed with 16 items, employing a 5-point Likert scale. For the purpose of scoring, points were set for each scale, starting with the lowest (1 point) for “never” and the highest (5 points) for “always.” Hence, the maximum overall score for the 16 items was 80 points. The total score for each respondent was computed before being converted into a percentage and classified as good (more than 60%) or inadequate (less than 60%).

### Reliability and validity tests

Prior to the actual survey, the questionnaire was pilot tested for the purpose of assessing the appropriateness of language and items. The Cronbach’s alpha for items related to self-reported food safety practices was 0.714. A value above 0.70 indicates an acceptable level of internal consistency, or reliability (85, 95).

### Statistical analysis

This study employed the SPSS version 20 for statistical analysis of the data. Data on socio-demographic characteristics were calculated as percentages, whereas a one-way ANOVA and independent sample *t*-tests were employed to determine the significance of differences between food safety practices and socio-demographic characteristics. Logistic

regression analysis based on the calculation of odds ratios (OR) and 95% confidence intervals (CI) were performed to ascertain whether the scores of food safety self-reported practices could be predicted by socio-demographic factors. The OR is an indicator of whether the factor under study actually affected the level of food safety practices. If the OR value is greater than 1, then the level of the food safety practices increased along with the predictor factors (27, 92). Statistical significance was fixed at  $P < 0.05$ .

## RESULTS

### Socio-demographic profiles of the respondents

In this study, 54.7% ( $n = 341$ ) of the respondents were females, 34.3% ( $n = 214$ ) were age 30 to 39 years old, 35.2% ( $n = 219$ ) were secondary school graduates, and 61.8% ( $n = 385$ ) were employed. The data showed that 41.4% ( $n = 258$ ) of the respondents had 3–5 family members, 33.1% ( $n = 206$ ) stated that they had 2 children, and 39.3% ( $n = 245$ ) prepared food at home during 3–5 days per week (Table 1).

### Self-reported food safety practices

It was found that 56.5% of the respondents always washed their hands with soap and water before cooking or eating, 30.5% of them left a meal in the refrigerator most of the time if family members were late for a hot meal, 48.5% sometimes selected refrigerated meat at the end of the shopping trip, 38.5% rarely stored raw meat on the lower shelf of the refrigerator, and 94.4% never used a thermometer to determine if the meat was well cooked (Table 2).

The scores for self-reported food safety practices differed significantly between males ( $29.22 \pm 5.46$ ) and females ( $35.73 \pm 6.57$ ):  $t(620.98) = 13.49$ ,  $P < 0.05$  (Table 3). Only 4.6% of the male respondents reported a good level of food safety practices, in comparison to females, who scored 40.5%. Other significant factors that affected the levels of self-reported food safety practices were education level, number of children, and frequency of preparing food. A total of 46.9% tertiary graduates scored ‘good’ for their food safety practices, compared with 11.7% of primary graduates (mean difference = 7.85,  $P < 0.05$ ) and 14.2% of secondary school (mean difference = 6.84,  $P < 0.05$ ) leavers. Of the respondents who had 3 or more children, 33.7% achieved a good practice level, compared with 14.4% of the respondents who did not have children (mean difference = 3.34,  $P < 0.002$ ) and 22.3% with at least one child (mean difference = 2.45,  $P < 0.02$ ). The respondents who prepared food every day at home scored better than those who prepared food only 3 to 6 days (mean score = 1.83,  $P < 0.017$ ) or less than 3 days (mean score = 3.70,  $P < 0.05$ ) per week. The difference was also significant between the 25.7% of respondents who prepared food 3 to 6 days and the 19.6% of those who prepared food less than 3 days per week (mean difference = 1.87,  $P < 0.013$ ).

This study probed further into the factors that affected the food safety practices of the respondents, with socio-

**TABLE 1. Respondents' demographic characteristics (n = 623)**

Variables	Frequency	Percentage
<i>Gender</i>		
Male	282	45.3
Female	341	54.7
<i>Age</i>		
20–29	132	21.2
30–39	214	34.3
40–49	166	26.6
50 and above	111	17.8
<i>Education level</i>		
Primary school and below	197	31.6
Secondary school	219	35.2
Tertiary school and above	207	33.2
<i>Employment status</i>		
Yes	385	61.8
No	238	38.2
<i>Number of person(s) in the family</i>		
1–2	156	25.0
3–5	258	41.4
6 and more	209	33.5
<i>Number of child(ren) in the family</i>		
0	111	17.8
1	202	32.4
2	206	33.1
3 and more	104	16.7
<i>Frequency of food preparation at home</i>		
Every day	184	29.5
3–6 days per week	245	39.3
Less than 3 days per week	194	31.1

demographic characteristics as the predictors. The outcomes of binary logistic regression was retrieved in this study (Table 4). Based on the Omnibus Tests of Model Coefficient [ $\chi^2 = 227.183, 14) P = 0.000$ ], as well as Hosmer and Lemeshow Test [ $\chi^2 = 5.887, 8) P = 0.660$ ], the model appeared to meet the criterion for estimating self-reported food safety practices among consumers, as the *P*-value exceeded 0.05 (70). Additionally, the variance for the practices was between 30.6% (Cox and Snell R Square) and 45.6% (Nagelkerke R Square), with 83.6% for the overall cases in this model.

The three variables that were identified as significant contributors to the model were gender, education level, and the number of children in the family. Females seemed to

emerge as the strongest contributor, with an OR of 21.82, indicating that female respondents' food safety practice level was better than that of males by over 21 times. For education level, those who claimed to be tertiary graduates appeared to be the second largest contributor to performing good practice, at 9.86 times higher than primary and secondary school leavers. The OR values for respondents with three and two children in the family were 3.51 and 2.74, respectively, signifying excellent food safety practices for both groups, compared with their counterparts. In contrast, respondents with 3–5 family members scored much lower with respect to good levels of food safety practices.

**TABLE 2. Distribution of scores for food safety self-reported practices**

No.	Statements	Never (%)	Rarely (%)	Sometimes (%)	Most of the time (%)	Always (%)
<b>Cross-contamination</b>						
1	I use different cutting boards to slice raw meat and to cut tomatoes.	4.7 (29/623)	23.1 (144/623)	39.5 (246/623)	20.5 (128/623)	12.2 (76/623)
2	Raw meat is stored at the lower shelf of the fridge (not freezer) in my house.	3.5 (22/623)	38.5 (240/623)	47.5 (296/623)	9.5 (59/623)	1.0 (6/623)
3	If I have sore on the back of my hand, I wrap the sore with a bandage before preparing food and wear a glove.	2.2 (14/623)	22.5 (140/623)	36.0 (224/623)	25.5 (159/623)	13.8 (86/623)
4	I wash the knife that has been used to cut raw meat with soap and water before using it again.	0.0 (0/623)	7.2 (45/623)	16.5 (103/623)	29.7 (185/623)	46.5 (290/623)
5	I take off jewelry before preparing food.	3.4 (21/623)	23.1 (144/623)	44.6 (278/623)	23.0 (143/623)	5.9 (37/623)
<b>Storage and Cooking</b>						
6	At home, I use a thermometer to check that the meat is well-cooked.	94.4 (588/623)	3.0 (19/623)	2.6 (16/623)	0.0 (0/623)	0.0 (0/623)
7	I fry eggs until the white and yolk are solid.	0.0 (0/623)	4.7 (29/623)	19.9 (124/623)	22.3 (139/623)	53.1 (331/623)
8	While shopping at the supermarket, I place refrigerated meat in my cart at the end of shopping.	0.0 (0/623)	26.2 (163/623)	48.5 (302/623)	12.0 (75/623)	13.3 (83/623)
9	I defrost frozen meat/chicken by leaving it in the fridge for a few hours.	0.3 (2/623)	22.6 (141/623)	42.9 (267/623)	23.3 (145/623)	10.9 (68/623)
10	I have a thermometer in my fridge.	89.6 (558/623)	6.9 (43/623)	3.2 (20/623)	0.3 (2/623)	0.0 (0/623)
11	If my family member is going to be several hours late for a hot meal, I place the meal in the fridge.	0.0 (0/623)	8.5 (53/623)	39.5 (246/623)	30.5 (190/623)	21.5 (134/623)
<b>Cleaning and Hygiene</b>						
12	I use paper towel to dry my hands after washing them.	0.2 (1/623)	14.6 (91/623)	34.3 (214/623)	27.8 (173/623)	23.1 (144/623)
13	I wash my hands after touching my face.	0.5 (3/623)	32.9 (205/623)	43.5 (271/623)	20.1 (125/623)	3.0 (19/623)
14	I treat fresh vegetables by dipping them in water and salt.	69.0 (430/623)	18.9 (118/623)	11.9 (74/623)	0.2 (1/623)	0.0 (0/623)
15	The kitchen sink drain in my house is sanitized daily.	0.0 (0/623)	12.7 (79/623)	33.1 (206/623)	25.4 (158/623)	28.9 (180/623)
16	I wash my hands with soap and water before cooking or eating.	0.0 (0/623)	1.0 (6/623)	11.9 (74/623)	30.7 (191/623)	56.5 (352/623)

**TABLE 3. Comparison of food safety practice levels**

Variables	Practice level (%)*		P-value**
	Poor	Good	
<i>Gender</i>			
Male	95.4	4.6 <sup>a</sup>	0.00
Female	59.5	40.5 <sup>b</sup>	
<i>Age</i>			
20–29	78.8	21.2	0.14
30–39	72.4	27.6	
40–49	77.7	22.3	
50 and above	75.7	24.3	
<i>Education level</i>			
Primary school	88.3	11.7 <sup>a</sup>	0.00
Secondary school	85.8	14.2 <sup>a</sup>	
Tertiary school	53.1	46.9 <sup>b</sup>	
<i>Employment status</i>			
Yes	75.1	24.9	0.85
No	76.9	23.1	
<i>Number of person(s) in the family</i>			
1–2	75.0	25.0	0.17
3–5	77.5	22.5	
6 and above	74.2	25.8	
<i>Number of child(ren) in the family</i>			
0	85.6	14.4 <sup>a</sup>	0.00
1	77.7	22.3 <sup>a</sup>	
2	73.3	26.7 <sup>b</sup>	
3	66.3	33.7 <sup>b</sup>	
<i>Frequency of food preparation at home</i>			
Every day	72.8	27.2 <sup>a</sup>	0.00
3–6 days per week	74.3	25.7 <sup>b</sup>	
Less than 3 days per week	80.4	19.6 <sup>b</sup>	

Note:

\*Means with the same letters do not differ significantly from each other.

\*\*Scores within groups with different letters are statistically significant at the 0.05 level based on the Bonferroni post hoc analysis.

## DISCUSSION

Overall, the self-reported food safety practices investigated in this research were unsatisfactory, because consumers in all categories of the socio-demographic profiles failed to surpass the cut-off point of 60%. Two groups, females and tertiary graduates, attained the best scores compared with others, a

finding that is similar to the findings reported in prior studies (6, 47, 84).

The results showed that washing hands with soap and water before cooking or eating was always practiced by 56.5% of the respondents, which seems to be in agreement with results of past studies that showed awareness among

**TABLE 4. Logistic regression analysis for food safety self-reported practices displayed by the respondents**

Variables	Overall practices			
	B	S.E.	OR (95% CI)	Significant
<i>Gender</i>				
Male			1.00	
Female	3.083	0.344	21.82 (11.12, 42.81)	0.00*
<i>Age</i>				
20–29			1.00	
30–39	0.418	0.330	1.52 (0.80, 2.90)	0.21
40–49	0.089	0.357	1.09 (0.54, 2.20)	0.80
50 above	0.165	0.388	1.18 (0.55, 2.52)	0.67
<i>Education level</i>				
Primary school			1.00	
Secondary school	0.504	0.322	1.66 (0.88, 3.11)	0.12
Tertiary school	2.288	0.303	9.86 (5.44, 17.86)	0.00*
<i>Employment status</i>				
Working			1.00	
Not working	-0.202	0.246	0.82 (0.50, 1.32)	0.41
<i>Number of person(s)</i>				
1–2			1.00	
3–5	-0.429	0.307	0.65 (0.36, 1.19)	0.16
6 and more	-0.363	0.315	0.70 (0.38, 1.29)	0.25
<i>Number of child(ren)</i>				
0			1.00	
1	0.691	0.395	2.00 (0.92, 4.33)	0.08
2	1.008	0.395	2.74 (1.26, 5.94)	0.01*
3 and more	1.256	0.426	3.51 (1.52, 8.09)	0.003*
<i>Frequency of food preparation</i>				
Every day			1.00	
3–6 days	0.231	0.282	1.26 (0.73, 2.19)	0.41
Less than 3 days	0.402	0.327	1.52 (0.80, 2.89)	0.20

Note: B, constant coefficient; S.E., standard error for the constant coefficient; OR, odds ratio.

\* $P < .05$ .

Omnibus Tests of Model Coefficients:  $\chi^2 = 227.183$ ,  $df = 14$ ,  $P = 0.000$ .

Hosmer and Lemeshow Test:  $\chi^2 = 5.887$ ,  $df = 8$ ,  $P = 0.660$ .

Nagelkerke  $R^2 = 0.456$ .

respondents that washing hands with soap and water is better than simply washing hands with only water to avoid transmission of foodborne pathogens, whereas application of disinfectants is encouraged to ensure effective hand sanitization (15, 30, 32, 44, 73, 101).

One should avoid consuming risky foods, such as raw eggs, as they are categorized in the second level of food vehicles that may contribute to *Salmonella* infection outbreaks. Thus it is best to consume only well-cooked eggs (23, 102, 105). In the present study, the respondents reported that they had used a hygienic practice, as they claimed to fry eggs until the white and yolk are solid, perhaps because they disliked raw eggs (106).

The result that appears to stand out in this study is the fact that a majority of the respondents (94.4%) did not use a thermometer when cooking meat. Using a thermometer is the most reliable method of ascertaining that food is well done and is thus clear from risks of pathogens. Griffith (31) asserted that consuming raw meat may result in an outbreak of *E. coli* O157 infection, which could lead to hemolytic uremic syndrome (HUS), particularly among young consumers. However, some pathogens, such as *Bacillus cereus*, *Staphylococcus* spp. and *Vibrio parahaemolyticus*, are also found in various types of cooked food (1, 4, 5).

Several prior studies also highlight the fact that inadequately cooked food may result in *Campylobacter* and *Salmonella* infections, mainly because these pathogenic bacteria can be completely destroyed only by food cooking thoroughly to 70°C (12, 18, 78). One reason for disregarding the use of thermometers is dependence on food color, taste, and texture to determine whether a particular dish, especially one containing a meat product is well done (45, 53, 91).

The tendency to use equipment that can fulfil the consumer's needs quickly, such as a microwave oven, is a prime example. It is owned by most consumers at home nowadays for reheating or cooking of food, and it may also be the reason for the lack of thermometer usage (66). This could be considered a good practice, however, because the Malaysian cooking style encourages marinating food with various of spices, and this, coupled with the use of a microwave oven, could potentially reduce the production of heterocyclic amines, which are possibly carcinogenic (42, 43).

In relation to thermometer use, this study found that many respondents (89.6%) did not have a thermometer in their refrigerators. In Malaysia, the recommended temperature for refrigerators is 4°C, and food stored at temperatures above this standard temperature may provide an excellent breeding ground for foodborne pathogens, thus compromising food safety (39, 55, 80, 99, 106). Because of the absence of thermometers in refrigerators, this study emphasizes as an effective measure to control temperatures in refrigerators, apart from raising awareness among users regarding the importance of adhering to the standard temperature, seal conditions and the distance to a heat source as alternatives,

in order to maintain a safe temperature for food safety (35). Besides equipping refrigerators with thermometers, the aspect of cleanliness of refrigerators also needs to be addressed, primarily because the door handle and the bottom shelf of a refrigerator have been identified as the critical areas for the growth of foodborne pathogens (20, 21).

In this study, groups comprised of females, tertiary graduates, families with 3 children, and those who prepared food every day achieved significantly better scores than others for food safety practices, and the regression model suggested that females, tertiary graduates, and families with 3 children were the significant predictors for food safety practice among the respondents. Consistent with prior studies, females indicated a good level in food safety practices, compared with males (64, 93). This particular result supports the notion of the essential role of females in families, especially in matters related to food handling at home (29).

As predicted, tertiary graduates seem to handle food more safely than their counterparts do. This is in line with findings reported in past studies of food safety practices (11, 19, 62, 98). This tertiary group, which is better educated, may be more aware of risks posed by FBDs because of their prior knowledge and greater exposure to information. For instance, those aware of the effects of *Listeria monocytogenes* infection would be likely to handle and store food products correctly in an effort to avoid the horrendous consequences of listeriosis (25).

Unexpectedly, this study revealed that families with 3 or more children used good food safety practices. This seems to contradict the results reported by George et al. (30) that found that many parents do not use practices of personal hygiene that prevent diarrheal infections. In general, the respondents appear to be aware and knowledgeable regarding the risks posed by FBDs and thus adopted safe food practices in an effort to protect their children from FBDs outbreaks. Parents who frequently prepare food at home would likely be well aware of the importance of food hygiene in staying healthy. Taylor et al. (96) reported that mothers, especially, tend to do their own research by reading or seeking websites on specific safe food practices in their attempt to avoid *Listeria* infection.

## CONCLUSION

This study shows that self-reported food safety practices among Sarawakian consumers are unsatisfactory and hence demand critical attention in several significant aspects, particularly the use of thermometers in cooking and temperature control in refrigerators. In addition, food safety education must be emphasized to enhance the awareness of the impact of pathogens present in foods on human health. Educational programs should be organized to disseminate information pertaining to personal and equipment hygiene in handling food, proper food storage methods, and ways to avoid high-risk foods so as to avoid outbreaks of FBDs.

Transmitting significant information via mass media may also provide valuable inputs to all levels of society, regardless of their background.

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