

Predicting adolescents' behavioural intentions in adulterated food management

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Abstract

Purpose – The purpose of this paper is to determine the function of adulterated food management (AFM) in the behavioural intentions of adolescents on food safety concerns.

Design/methodology/approach – The methodology is exploratory in nature and uses analysis of variance and regression in determining the predictive power of the independent variables (AFM's mediator variables) on the dependent variables (food safety concern and AFM behaviour intention). For this, a survey was conducted on middle and high school students in South Korea using a five-point Likert scale.

Findings – Perceived beliefs on, and competency and behavioural intention in, AFM significantly differed depending on food safety concern level ($p < 0.01$). When perceived beliefs and competencies of AFM were regressed against behavioural intention, the model was highly significant and showed huge variance ($R^2 = 0.65$). The factors influencing AFM in behavioural intention differed among all three groups: high concern group (efficacy, attitude and situation management), medium concern group (benefits, efficacy, attitude, situation management and hygiene practices) and low concern group (benefits, barriers and situation management). Therefore, AFM education should be observed with emphasis on varying points depending on the level of food safety concern.

Research limitations/implications – As this study only focused on exploring probable predictors for the criterion (perceived food safety concern), the contributions of each mediator factor to the full model are not covered in this study. Future investigations can include the study of individual variables and residuals to remove biases that may be present in the model.

Originality/value – The study will contribute to the safety of society and the health of adolescents by solving the issue of food safety and the problem of adulterated food in the aspect of the beliefs and competence of adolescents according to their concern level.

Keywords Adolescents, Beliefs, South Korea, Behavioural intention, Competency, Adulterated food management

Paper type Research paper

Introduction

Food safety is achieved when food does not cause harm to the consumer or lead to illness during its preparation, service and consumption following its intended use (FAO/WHO, 2003). Because food safety concerns are considered worldwide social issues, considerable efforts have been expended to improve food safety (Liu *et al.*, 2015; De Boeck *et al.*, 2017). Foodborne diseases have become one of society's increasingly incurring health and food safety concerns with the considerable morbidity and mortality problems they have caused globally (Linscott, 2011; Knabel, 1995). Foodborne diseases come from food adulteration, which, primarily, is the product of the illegal processing of food in the course of its production and distribution, in forms such as the presence of pesticide residues, an illegal overdose of additives and an excessive presence of metal content (Liu and Ma, 2016). People's concern over food safety issues and scandals has escalated exponentially over the past decade (Liu and Ma, 2016). Here, producers process the food without complying with food hygiene regulations. Moreover, the description and/or



labelling of food must be honest and accurate, but there are several ways in which food can be misdescribed. This includes substitution of an ingredient with something similar yet cheaper, which extends or adulterates food with a cheaper or base material; presence of undeclared ingredients, which extends or adulterates food to increase value; non-declaration or false declaration of processes; over-declaration of a quantitative ingredient; and false claims regarding geographical or production origin (Primrose *et al.*, 2010). In fact, the Korean Government has defined adulterated food as one of the four social evils, together with school violence, domestic violence and sexual violence and, thus, has been making aggressive efforts to eradicate adulterated food (Kim, 2018).

As adolescence is a crucial period in a person's development, adulterated food can negatively affect adolescents' physical and emotional health with the poor nutrition this kind of food provides. Good nutrition for adolescents is only possible when they can get a sufficient amount of healthy and safe food (KMGL, 2015). However, adolescents remain vulnerable to consuming adulterated food because of lack of food safety awareness, strong appetites, lack of resources and instinctive behaviour or giving in to their cravings (Song and Choi, 2013). Therefore, adolescents should develop basic values on food and dietary management capacities to improve and maintain their health and as members of society. Despite the Korean Government's measures to control the food that is sold in school zones, adolescents continue to risk their health in buying high-calorie adulterated food, which leads to problems of obesity (Kim, 2016a; Park and Son, 2010).

For effective food safety education, understanding factors that affect adulterated food is important. For this, cultural studies have also been actively carried out to solve problems related to food safety (De Boeck *et al.*, 2017). In fact, cultural factors, including beliefs and attitudes on food and health, can be used as a bridge between adulterated food management (AFM) and food safety-related behaviours (Nyarugwe *et al.*, 2018; Griffith *et al.*, 2010a, b; Hudson, 2007). Behaviour related to food, nutrition and health is often made based on people's health beliefs. With this, the health belief model (HBM) has been one of the most used psychological models that attempt to explain and predict health behaviour. Park (2011) revealed that various factors are at play in adolescents' health behaviour, such as demographic factors, and dietary beliefs such as perceived severity, perceived barriers and perceived benefits and self-efficacy. The theory of planned behaviour of Ajzen and Fishbein (1980) can be applied to children's food safety behaviour. Knowledge, attitude and practice towards food safety are included in the integrated conceptual model and are being studied for education to develop health and food hygiene and safety competence (Jenie *et al.*, 2015; Agüeria *et al.*, 2018). Kim (2018) reported the concern on the adulterated food of adolescents' parents impacted on the attitude, necessity, hygiene and nutrition, knowledge, citizen action and environment grasp capability of AFM of parents ($p < 0.01$). Thus, the health of adolescents related to food safety can be predicted by cultural factors such as health belief and behaviour theory.

This study referred to Park (2011) as basis, which reported that the degree of health beliefs affecting weight management intention differs according to the obesity of adolescents, and Park and Son's (2010) study, which stated that knowledge of food safety and attitude towards adulterated food affects adulterated food purchasing behaviour. Thus, the purpose of this study is to investigate perceived belief, efficacy and competency of adolescents on AFM affecting food safety awareness as shown in Figure 1. The null hypothesis in all the independent variables to be tested will have a zero coefficient. The alternative for this is that at least one of the variables tested will be a non-zero. The following null hypotheses are tested against in this study:

H_{01} . There is no significant difference in the perceived food safety concern levels among characteristics of: school, sex, adulterated food purchasing experience, number of meal preparations, health condition, weight classification and father's employment.

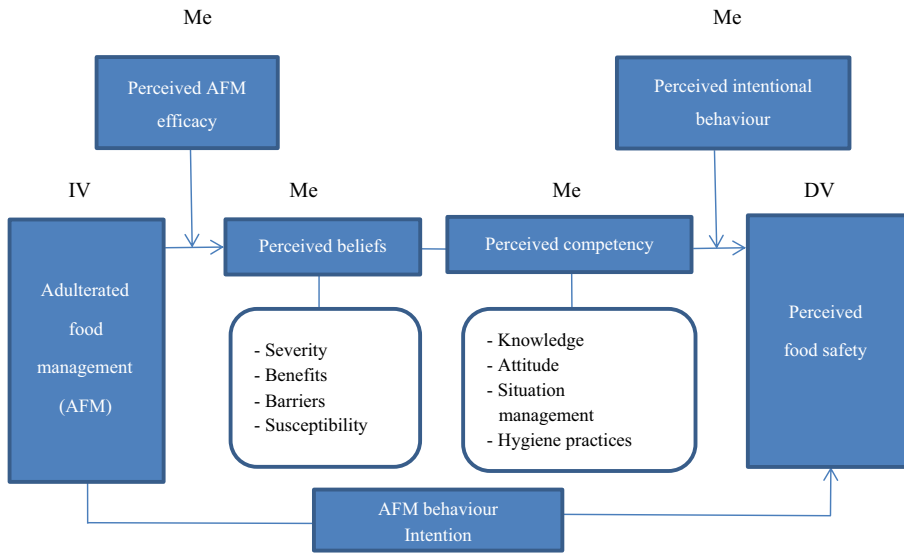


Figure 1.
Conceptual framework

Notes: Me, mediator variable; IV, independent variable; DV, dependent variable

- H_{02} . There is no significant difference in the perceived three food safety concern levels based on AFM's belief (mediator) factors: severity, benefits, barriers and susceptibility.
- H_{03} . There is no significant difference in the perceived food safety concern levels based on AFM's (mediator) factors of efficacy
- H_{04} . There is no significant difference in the perceived food safety concern levels based on three of AFM's (mediator) factors of competency: knowledge, attitude, situation management and hygiene practices.

Methods

Participants

Surveys with missing data on key variables were excluded from the analysis; 316 out of 340 surveys were analysed from two middle schools and two high schools, chosen by cluster sampling in Gyeongbuk Province, South Korea, from June to August 2015. The subjects of this study consisted of 44 first-, 60 second- and 62 third-grade students, and 74 first- and 76 second-grade students.

Questionnaire development and contents

Park and Son (2010) reported that parental and media-based food safety education affected food safety knowledge, beliefs and attitudes towards substandard food, which, in turn, influenced bad food purchasing behaviours. Park (2011) had conducted a study to predict obesity management behaviour by applying the health beliefs theory according to the obesity rate in adolescents. Studies by Park and Son (2010) and Park (2011) were identified as the most relevant research for the creation of this study's questionnaire. In this study, Park's (2011) research method was applied to predict the AFM behavioural intention based on the HBM and added competency. The first instrument was modified to suit this

study's purpose. For the first draft of the questionnaire, two food safety experts plus a home economics teacher checked to make sure that questions are appropriate for the level of understanding of middle school students. After the pilot test with ten students, some items were modified and rephrased. The questionnaire's construct was based on the HBM, related dietary beliefs, such as perceived severity (3 items), benefits (4 items), barriers (6 items) and susceptibility (2 items), as well as self-efficacy (9 items), AFM behaviour intention (7 items) and competency (20 items). These sub-factors are part of the hypotheses tested in this study. Furthermore, variables in the construct were as follows: student's grade, sex, health condition, number of meal preparations, food safety awareness, adulterated food purchasing experience and weight classification.

Factor analysis of the AFM beliefs, efficacy, behaviour intention and competency

All of the variables were organized in a five-point Likert scale (1 for strongly disagree; 5 for strongly agree). Each of the AFM belief factors and the perceived behaviour intention factor were extracted, and subsequently categorized as one factor, respectively (Table I). The perceived severity scale consisted of three items about disease and inconvenience (Cronbach's $\alpha=0.59$). The perceived benefits scale had four items about needs and advantages (Cronbach's $\alpha=0.73$), while six items were used in the perceived barriers scale about the difficulty of AFM (Cronbach's $\alpha=0.72$). The perceived susceptibility scale had two items about worry on the food hygiene and safety and adulterated food (Cronbach's $\alpha=0.72$), and the self-efficacy scale consisted of nine items about the confidence on the AFM (Cronbach's $\alpha=0.81$). Lastly, the behaviour intention scale consisted of seven items about AFM volition (Cronbach's $\alpha=0.82$).

The perceived AFM competency can be divided into four sub-factors (Table II): the knowledge scale with six items (Cronbach's $\alpha=0.79$); the attitude scale with three items (Cronbach's $\alpha=0.69$); the situational management scale with three items (Cronbach's $\alpha=0.66$); and the hygiene practices scale with two items (Cronbach's $\alpha=0.75$). The cumulative explanatory power was 60.13 per cent.

Statistical analysis

This study's mediator variables may connect the relationship between the independent variable (AFM) and the dependent variable (perceived food safety concern). The mediator variables that are tested in this study are AFM perceived efficacy, perceived beliefs, perceived competency and perceived behavioural intention. The perceived food safety concern groups were divided into three categories: high, moderate and low. All statistical analyses were conducted according to the three concern groups.

SPSS software programme version 24 was used for the analyses. Descriptive statistics were calculated for all relevant variables. χ^2 -tests were applied to analyse the categorized variables. The differences among the means were determined by analysis of variance (ANOVA), followed by the Ryan-Einot-Gabriel-Welsch *F*-test. Stepwise multiple regression analysis was completed to determine the relationship between food safety concern and AFM behavioural intention (dependent variable).

Results

General characteristics by food safety concern level

For the cluster sampling, there were 159 (50.3 per cent) male and 157 (49.7 per cent) female students (Table III), from which most showed a high interest in food safety. Out of the 316 respondents, 229 (72.5 per cent) had experience in buying adulterated food, and 127 (40.2 per cent) answered with almost never for the number of meal preparations. The health condition of 257 (81.3 per cent) respondents was good. The weight classification of

BFJ 122,1	Factors	Cronbach's α
262	<i>Perceived severity</i>	
	1. I think food poisoning is caused by bad food	0.59
	2. I think that bad food can cause serious illness	
	3. I think that everyday activities will be difficult if I get an illness from food poisoning or bad food	
	<i>Perceived benefits</i>	
	1. AFM helps prevent disease	0.73
	2. AFM is needed to create a reliable society	
	3. AFM is essential for health care	
	4. AFM is necessary for a happy family life	
	<i>Perceived barriers</i>	
	1. Hygienic and safe dietary management is very uncomfortable	0.72
	2. I think hygienic and safe dietary management is costly	
	3. I do not think there is much safe food around	
	4. I think it is very difficult to change the eating environment around me	
	5. It is very difficult not to eat bad food when I eat with friends	
	6. I eat bad food when I am stressed	
	<i>Perceived susceptibility</i>	
	1. I worry about hygiene and safety when purchasing food	0.72
	2. I am worried about my health when purchasing food	
	<i>Perceived efficacy</i>	
	1. I can distinguish food that is cheated, over-hyped or over-hyped for origin, price and quality	0.81
	2. I can explain to others about bad food	
	3. I think I have enough knowledge of bad food	
	4. I am confident in getting information about bad food	
	5. I can sanitize my kitchen utensils and tools	
	6. I can make the cooking process hygienic when I make food or help with food preparation	
	7. I can store food hygienically	
8. I can invite friends to avoid buying bad food		
9. I can participate in the boycott of a non-hygienic food store		
<i>Perceived behaviour intention</i>		
1. I will encourage people not to buy bad food	0.82	
2. I will eat a healthy diet		
3. I am confident that I will defeat the temptation of people around buying bad food		
4. I will be interested in bad food and try to get relevant information		
5. I am likely to check and purchase food labels when purchasing food		
6. I will do my best to think about hygiene and safety in the future		
7. I am likely to act hygienically when preparing food or helping to prepare food		

Table I.
The items of AFM beliefs, efficacy and behavioural intention

67 (21.2 per cent) students was overweight and obese. Father's employment of 104 (32.9 per cent) was that of an office worker. As interest in food safety increased, students perceived their health as good and underweight students were more interested in food safety ($p < 0.05$). In the group of high food safety concern of adolescents, their father's employment was significantly higher in services ($p < 0.05$).

Four factors yielded significant interactions with perceived food safety concerns ($p < 0.05$): number of meal preparations, health condition, weight classification and father's employment. Results indicate that respondents who perceived themselves as having the higher number of meal preparations also have higher food safety concern (41.1 per cent). More respondents from the low concern group perceived their health condition as fair

Factors	Loading	Eigenvalue	Accumulation variance (%)	Cronbach's α
<i>Knowledge</i>				
1. I know the kinds and hazards of additives that are contained in food	0.75	3.01	21.51	0.79
2. I am aware of prohibited food additives	0.72			
3. I know the kinds and risks of pathogenic microorganisms	0.72			
4. I know about the hygiene and safety of our school meals	0.70			
5. I know how to report bad food	0.67			
6. I know about the nutrition of my school feeding	0.65			
<i>Attitude</i>				
1. I think I should always pay attention to and try to be healthy	0.83	1.96	14.02 (35.53)	0.69
2. I think that we can reduce defective food with our interest and efforts	0.76			
3. I think that food should be hygienic and safe	0.65			
<i>Situation management (reverse)</i>				
1. It is very difficult not to eat bad food when I am with friends	0.78	1.83	13.03 (48.56)	0.66
2. I eat bad food when I am angry or sad and depressed	0.76			
3. When I am hungry, I eat without thinking it is bad food	0.74			
<i>Hygiene practices</i>				
1. I wash my hands thoroughly before eating	0.89	1.62	11.57 (60.13)	0.75
2. I wash my hands before making food or helping with food preparation	0.81			

Table II.
Factor analysis of AFM competency

(30.6 per cent) compared to the other groups. A more significant percentage (16.8 per cent) from the high concern group perceived themselves as underweight and is seconded by the low concern group (10.2 per cent). The medium concern group has fathers who belong to office works (39 per cent). The higher number from the high concern group has fathers who belong to services (23.2 per cent), whereas 15 per cent of the medium concern group have fathers who belong to functional, agriculture and fisheries jobs.

Adulterated food management beliefs, efficacy and competencies by food safety concern level

The figures found in Table IV show that respondents from the high concern groups tend to exhibit more awareness about AFM (e.g. perceived severity, benefits, susceptibility and efficacy) and AFM competency factors. The mean scores of the total perceived severity, benefits, barriers and susceptibility were 3.71 ± 0.70 , 3.49 ± 0.69 , 2.88 ± 0.59 and 3.16 ± 0.81 , respectively. The mean score of the total perceived severity and benefits showed significant differences among the high, medium and low concern groups ($p < 0.001$). However, the awareness of disability was significantly lower in the high interest group than in the other groups ($p < 0.01$). Looking at the general trend, the figures showed that the high concern group has agreed to more item statements than the medium and low concern groups, and that the three groups statistically differed at significant levels in their perceptions of the items. This means that the independent variables in the model improved the fit. The mean score of the total perceived susceptibility factor showed significant differences among the high, medium and low concern groups ($p < 0.001$). There are three striking features in the

Factors	Food safety concern				χ^2
	Total 316 (100.0)	High 95 (30.1)	Middle 172 (54.4)	Low 49 (15.5)	
<i>School</i>					
Middle	166 (52.5)	56 (58.9)	81 (47.1)	29 (59.2)	4.48
High	150 (47.5)	39 (41.1)	91 (52.9)	20 (40.8)	
<i>Gender</i>					
Male	159 (50.3)	53 (55.8)	82 (47.7)	24 (49.0)	1.65
Female	157 (49.7)	42 (44.2)	90 (52.3)	25 (51.0)	
<i>Adulterated food purchasing experience</i>					
Yes	229 (72.5)	71 (74.7)	118 (68.6)	40 (81.6)	3.60
No	87 (27.5)	24 (25.3)	54 (31.4)	9 (18.4)	
<i>Number of meal preparations</i>					
Almost	100 (31.6)	39 (41.1)	49 (28.5)	12 (24.5)	12.88*
Half	89 (28.2)	29 (30.5)	51 (29.6)	9 (18.4)	
Almost nothing	127 (40.2)	27 (28.4)	72 (41.9)	28 (57.1)	
<i>Healthy condition</i>					
Good	257 (81.3)	84 (88.4)	140 (81.4)	33 (67.3)	9.67*
Fair	54 (17.1)	10 (10.5)	29 (16.9)	15 (30.6)	
Bad	5 (1.6)	1 (1.1)	3 (1.7)	1 (2.1)	
<i>Obesity rate</i>					
Low weight	29 (9.2)	16 (16.8)	8 (4.7)	5 (10.2)	13.05*
Normal	220 (69.6)	58 (61.1)	126 (73.3)	36 (73.5)	
Over weight	52 (16.5)	17 (17.9)	30 (17.4)	5 (10.2)	
Obesity	15 (4.7)	4 (4.2)	8 (4.6)	3 (6.1)	
<i>Father's employment</i>					
Professional works	87 (27.5)	30 (31.6)	42 (24.4)	15 (30.6)	17.73*
Office works	104 (32.9)	25 (26.3)	67 (39.0)	12 (24.5)	
Services	45 (14.2)	22 (23.2)	15 (8.7)	8 (16.3)	
Functional, agriculture and fisheries	40 (12.7)	8 (8.4)	26 (15.1)	6 (12.3)	
Others	40 (12.7)	10 (10.5)	22 (12.8)	8 (16.3)	

Table III.
Interaction of general characteristics factors and levels of perceived food safety concern

Notes: n (%). * $p < 0.05$

trend of responses to the items in this factor, and these are: there seems to have been a general awareness about the problem of adulterated food, there is recognition of the need to manage food, the respondents are slightly optimistic rather than pessimistic and there is a slight cautiousness about food purchases because of their susceptibility. The mean score of the total AFM efficacy was 3.19 ± 0.56 , and students in the high concern group showed the highest total mean score (3.45 ± 0.56). The mean score of the total AFM efficacy showed significant differences among the high, medium and low concern groups ($p < 0.001$). Given this, there is sufficient evidence to show that the statistical model (ANOVA) fits the data.

The mean score of the knowledge factor of the AFM competency was 2.66 ± 0.66 , and students in the high concern group showed the highest total mean score (2.80 ± 0.73). The mean score of the attitude factor of the AFM competency was 3.71 ± 0.66 , and students in the high concern group showed the highest total mean score (3.99 ± 0.62). The mean score of the situation management factor of the AFM competency was 3.10 ± 0.83 , and students in the high concern group showed the highest total mean score (3.35 ± 0.79). The mean score of hygiene practices factor of the AFM competency was 3.94 ± 0.77 , and students in the high concern group showed the highest total mean score (4.18 ± 0.73). The mean score of all factors of AFM

Table IV. Perceived AFM beliefs, efficacy, competency and behaviour intention levels of perceived food safety concern

Factors	Total (n = 316)	High (n = 95)	Food safety concern		F
			Middle (n = 172)	Low (n = 49)	
Perceived severity	3.71±0.70	3.95±0.63 ^a	3.67±0.68 ^b	3.42±0.79 ^c	10.42***
Perceived benefits	3.49±0.69	3.73±0.71 ^a	3.45±0.64 ^b	3.17±0.70 ^c	12.04***
Perceived barriers	2.88±0.59	2.68±0.57 ^b	2.95±0.57 ^a	2.99±0.63 ^a	7.49**
Perceived susceptibility	3.16±0.81	3.67±0.79 ^a	3.08±0.68 ^b	2.45±0.66 ^c	49.77***
Perceived efficacy	3.19±0.56	3.45±0.56 ^a	3.16±0.44 ^b	2.81±0.70 ^c	25.90***
<i>Competency</i>					
Knowledge	2.66±0.66	2.80±0.73 ^a	2.66±0.55 ^a	2.41±0.80 ^b	5.86**
Attitude	3.71±0.66	3.99±0.62 ^a	3.65±0.61 ^b	3.40±0.69 ^c	16.47***
Situation management	3.10±0.83	3.35±0.79 ^a	3.02±0.70 ^b	2.88±0.94 ^b	6.91**
Hygiene practices	3.94±0.77	4.18±0.73 ^a	3.83±0.75 ^b	3.89±0.86 ^b	6.28**
AFM behaviour intention	3.17±0.48	3.78±0.59 ^a	3.45±0.53 ^b	3.17±0.48 ^c	21.89***

Notes: mean ± SD. ^{a,b,c}Means in the same column with different superscripts are significantly different by the result of Ryan-Einot-Gabriel-Welsch F test. ***p* < 0.01; ****p* < 0.001

competency in the high concern group is higher than the others (*p* < 0.01). Given this, there is sufficient evidence to show that the statistical model (ANOVA) fits the data.

The mean score of the total intention of AFM was 3.17±0.48, and students in the high concern group showed the highest total mean score (3.78±0.59). The mean score of the intention of AFM showed significant differences among the high, medium and low concern groups (*p* < 0.001). The *F*-test reveals that the model has a good fit to the data. There can be a joint effect in the interaction of the variables in this factor.

Correlation between AFM beliefs, competency factors and behaviour intention

Table V shows the correlations between the AFM severity, benefits, barriers, susceptibility, efficacy and competency factors, and the behavioural intentions of the subjects. The perceived severity of adulterated food was significant (*p* < 0.05) among perceived benefits, susceptibility, efficacy, attitude and behaviour intention. The perceived barriers showed negative correlations with benefits, susceptibility, efficacy, attitude, situation management, hygiene practices and behaviour intention (*p* < 0.05), while the situation management factor of the AFM competency showed a significant correlation with all the factors except the knowledge factor (*p* < 0.05). The perceived benefits, susceptibility, efficacy, attitude, hygiene practices, and AFM behaviour intention showed a significant correlation with all the factors (*p* < 0.05). Therefore, to lead the AFM behaviour of adolescents, it is necessary to recognize

Table V. Correlation between AFM beliefs and competency and behavioural intentions

Factors	1	2	3	4	5	6	7	8	9	10
Perceived severity	1									
Perceived benefits	0.57**	1								
Perceived barriers	-0.09	-0.15**	1							
Perceived susceptibility	0.43**	0.50**	-0.15**	1						
Perceived efficacy	0.30**	0.35**	-0.28**	0.50**	1					
<i>Competency</i>										
Knowledge	0.01	0.18**	-0.07	0.27**	0.62**	1				
Attitude	0.48**	0.45**	-0.31**	0.42**	0.60**	0.20**	1			
Situation management	0.13*	0.18**	-0.80**	0.26**	0.19**	0.06	0.26**	1		
Hygiene practices	0.17**	0.20**	-0.20**	0.24**	0.40**	0.14*	0.40**	0.13*	1	
AFM behaviour intention	0.38**	0.45**	-0.36**	0.49**	0.71**	0.34**	0.72**	0.32**	0.39**	1

Notes: **p* < 0.05; ***p* < 0.01

the problem of adulterated food, form the will to avoid adulterated food, eliminate perceived barriers, control hygiene and ensure that they are actively trying not to eat adulterated food.

Predicting behavioural intention of adulterated food management

Stepwise multiple regressions by the subjects' food safety concern groups are presented in Table VI. When perceived severity, perceived benefits, perceived barriers, perceived susceptibility, self-efficacy, knowledge, attitude, situation management and hygiene practices were regressed against behavioural intention, the model was highly significant, and it explained a big variance ($R^2 = 0.65$). While perceived severity, barriers, susceptibility and knowledge capacity were not significant, benefits, efficacy, attitude, situation management and hygiene practices ($p < 0.01$) were significantly associated with the behavioural intention of AFM in total. Here, attitude appeared to have the highest importance among the five variables.

For the high food safety concern group, self-efficacy, attitude and situation management were the significant variables. One subtitle variable was found significant under the AFM beliefs factor, which is efficacy ($p < 0.001$). Under the AFM competency factor, attitude ($p < 0.001$) and situation management ($p < 0.05$) were both found significant at these levels. For the total interaction effect, the coefficient ($R^2 = 0.65$) was found significant on the *F*-test ($p < 0.001$), which means that the joint interaction of all independent variables yielded a significant main effect. Looking at the individual coefficient of the AFM behavioural intention factor on food safety concern (high concern group, $R^2 = 0.59$, $p < 0.001$), efficacy and attitude were significant ($p < 0.001$), as well as situation management ($p < 0.001$). From the medium concern group ($R^2 = 0.67$, $p < 0.001$), benefit and efficacy were both significant ($p < 0.05$); efficacy was also significant ($p < 0.001$). Under the sub-factors of beliefs, attitude, situation management, and hygiene practices were significant ($p < 0.05$) under the sub-factor competency. Benefit, barriers and situation management were found significant ($p < 0.05$) in the low concern group ($R^2 = 0.50$, $p < 0.001$) under the sub-factors of beliefs and competency.

Discussion

This study was conducted to investigate the impact of the beliefs and competency of AFM that adolescents have on their behavioural intention according to their food safety concern levels. The proportion of adolescents who had purchased adulterated food was very high (72.5 per cent), so education about adulterated food for young people was actively required.

Factors	Food safety concern							
	Total (n = 316)		High (n = 95)		Middle (n = 172)		Low (n = 49)	
Dependent variables	$(R^2 = 0.65,$ $F = 63.08^{***})$		$(R^2 = 0.59,$ $F = 15.40^{***})$		$(R^2 = 0.67,$ $F = 37.87^{***})$		$(R^2 = 0.50,$ $F = 6.08^{***})$	
Independent variables	β	<i>t</i>	β	<i>t</i>	β	<i>t</i>	β	<i>t</i>
Perceived severity	-0.03	-0.72	0.20	2.05	-0.11	-1.77	0.04	0.27
Perceived benefits	0.12	2.64**	-0.12	-1.22	0.17	2.46*	0.29	2.52*
Perceived barriers	0.00	0.02	0.06	0.63	-0.02	-0.33	0.43	2.20*
Perceived susceptibility	0.04	0.99	-0.05	-0.61	0.03	0.59	0.01	0.07
Perceived AFM efficacy	0.39	6.46***	0.43	3.67***	0.38	5.49***	0.41	2.03
	<i>Competency</i>							
Knowledge	0.01	0.29	0.06	0.60	-0.02	-0.31	0.13	0.72
Attitude	0.39	7.88***	0.44	4.87***	0.43	6.22***	0.16	0.97
Situation management	0.18	3.58***	0.18	2.11*	0.17	2.50*	0.54	2.77**
Hygiene practices	0.14	3.69***	0.04	0.54	0.18	3.22**	0.10	0.77

Table VI.
The Interaction of
AFM Beliefs, efficacy
and competency
factors' behavioural
intention on perceived
concerns for food

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

In a study by Park and Son (2010), 62.2 per cent of their respondents were elementary school students, and they did not buy adulterated food. However, in this study, 72.5 per cent of their adolescent respondents had experience with regard to buying adulterated food. Liu and Ma (2016) found out that there is a higher concern regarding food safety risks in more educated citizens with more media exposure, and that the amplification effect of food scandals has greater prominence among residents with higher education.

The independent variables (AFM beliefs) tend to apply better to the high concern group than they did to the low concern group. A likely trend in the figures found in Table IV shows that respondents from the high concern group tended to show more awareness about adulterated food (e.g. food as sources of poison, illness and difficulties, and managing bad food to prevent disease), compared to those from the low concern group. Looking at the general trend, the figures showed that the high concern group is in higher agreement with the item statements than the medium and low concern groups and that the three groups statistically differed at significant levels in their perceptions of the items. All the items under efficacy in this factor except one with $p < 0.05$ level were found to be statistically significant. While each item variable may have influence over the other item variables, the F -test sums the predictive power of all independent variables. The figures in Table IV indicate the trend in which the high concern group tends to agree on items more than the medium and low concern groups.

Spencer and Spencer (1993) identified five types of competency characteristics consisting of motives, traits, self-concept, knowledge and skills. The AFM competency analysed knowledge, attitude, situation management and hygiene practices factors in this study. Adolescents are reported to be influenced by friends and emotions in their dietary management (Salvy *et al.*, 2012; O'Neil *et al.*, 2014; Aydin *et al.*, 2017). It was found that the AFM competency included the situation management factor; unhealthy eating habits of adolescents were found to be more susceptible to negative emotional conditions and people around them. The ability to choose healthy food without being influenced by their own emotions and friends is considered to be a major AFM competency. The statistical analysis showed that all sub-factors (except for the knowledge factor) in the variable competency were found significant at $p < 0.01$.

The AFM behaviour intention showed a significant correlation with all factors of beliefs and competencies ($p < 0.05$). Thus, it is necessary to educate adolescents to raise their awareness about AFM and to strengthen their beliefs and competencies to eliminate barriers to adulterated food. The knowledge factor has a positive correlation with all factors including benefits, susceptibility, efficacy, attitude, situation management, hygiene practices and behaviour intention. Therefore, adulterated food education is more actively focused on nutritional and hygienic safety, such as the awareness towards food additives, pathogenic microorganisms and school food service. Moreover, the ability to discern food additives is considered to be the reading of food labels. Song and Choi (2013) reported in their study that only 44 per cent of junior high school students checked food labels and lessened the confirmation as the grade level increased. It may be effective if knowledge education for AFM is done with a focus on food labels, which can be a way for young people to directly receive or comprehend information related to food quality upon purchase of processed food.

These findings were reflected in the beta coefficients obtained for the high, medium and low concern groups. Efficacy, attitude and situation management were the significant predictors of the high concern group, whereas benefit, efficacy, attitude, situation management and hygiene practice were significant predictors for the medium concern group. On the other hand, benefit, barrier and situation management were found to be significant predictors for the low concern group. However, the situation management of the AFM competency is a main factor across all groups. Programs that promote emotional

control and the willingness to avoid unhealthy or additive rich food will likely have more reaching effects. Adolescents in this study tended to agree to manage adulterated food practices to promote a healthy life. Given this trend, there is a ground basis in stating that adolescents who belong to the high and medium concern groups are more likely than the low concern group to respond positively to promotional drives against adulterated food because of their food safety concern. Increasing the awareness about adulterated food and building the capacity, knowledge, attitude, situation management and hygiene practices of adolescents on the facts about adulterated food may be able to address some food-related problems in schools.

The study proposed a psychological model that explains and predicts the adolescents' AFM's intentional behaviours on perceived food safety concerns (Figure 2). It proposed that changes in perceived intentional behaviours on food safety can be predicted by the changes in perceived beliefs and competency in managing adulterated food practices. As beliefs and competency require certain types of knowledge, attitudes and practices, if changes in behavioural intentions can be predicted, then they can be modified. These modifiers can be

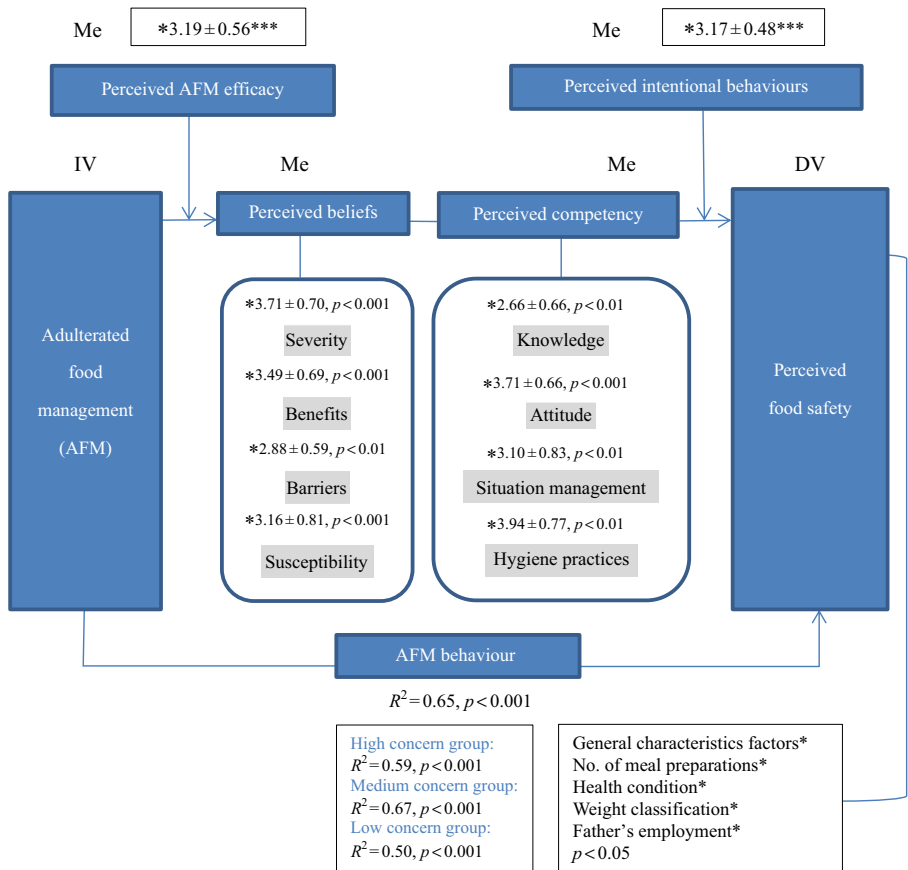


Figure 2. Graphical view of the status of interactions of variables in the model

Notes: Me, mediator variable; IV, independent variable; DV, dependent variable. 5-point Likert scale: 1 – strongly disagree; 2 – disagree; 3 – neutral; 4 – agree; 5 – strongly agree.*Obtained mean. $***p = 0.001$ in *F*-test

applied to influence changes in perceptions of food safety; this is where education will be able to affect the most change in adolescents' beliefs and competencies related to food adulteration.

While its explanatory power was significantly high at 65 per cent, attitude, a major predictor of behavioural intentions (Lorenz *et al.*, 2017), seemed to be the most important among the nine variables. Attitude refers to enduring positive or negative feelings an individual has about a person, object or issue and behaviour is the manifestation of attitude (Kollmuss and Agyeman, 2002). Park and Son (2010) reported that attitudes towards bad food had a negative impact on bad food purchasing behaviour ($p < 0.001$). The students who are interested in food safety were significantly higher than those of other interested groups ($p < 0.001$). A significant percentage of all food poisoning cases takes place in single households (EFSA, 2016). Reducing the risks and occurrences of food poisoning depends not only on the maintenance of adequate food hygiene practices by food professionals, but also on purchasing consumer behaviour, their food safety attitudes and hygiene during food preparation (Tomaszewska *et al.*, 2018).

Several studies have shown that food safety knowledge and self-reported behaviour do not co-relate well with the food handlers and consumers (Al-Shabib *et al.*, 2016; Bruhn and Schutz, 1999; Redmond and Griffith, 2003; Kim and Kim, 2006). However, Kim (2016b) reported that the health- and family-oriented lifestyles of adolescents significantly affected AFM behavioural intentions; such reported behaviours provide an insight into what consumers know and what they need to be educated on (Redmond and Griffith, 2003). Shown in the framework are the obtained means, the corresponding significant p levels and the obtained coefficients for each group that was included in the analysis (Figure 2). The mediator variables explain the interactional relationship among the AFM factors (independent variables) and the response variable – the perceived food safety concern (dependent variable).

The study proposes a psychological model that explains and predicts the adolescents' AFM's intentional behaviours on perceived food safety concerns. It proposes that changes in perceived intentional behaviours on food safety can be predicted by the changes in perceived beliefs and competency in managing adulterated food practices. Because this study only focused on exploring probable predictors for the criterion (perceived food safety concern), the contribution of each mediator factor to the full model in the currently recognized dependent variable is not covered in this study. This area can be studied in future investigations that will include the study of individual variables and the residuals to remove biases that may be present in the model. A high coefficient determination obtained (R^2) may not always mean an unbiased model because other unknown variables once revealed may take an overturn in today's result. A non-random residual pattern, for instance, indicates a bad fit despite a high R^2 .

Conclusion

The study has identified four major components that influence one's perceived food safety concerns and behaviours: certain general characteristics factors, such as the number of meal preparations, health condition, weight classification and father's employment; the total mean of AFM benefits, barriers, susceptibility, efficacy, competency and behaviour intention ($p < 0.01$); the AFM behaviour intention correlation with AFM mediator variables ($p < 0.01$); and AFM mediator variables such as perceived benefits, efficacy, attitude, situation management and hygiene practices ($p < 0.01$). However, the independent variables exhibit stronger relationships with the high concern group than they do with the low concern group. Efficacy, attitude and situation management are the significant predictors of the high concern group, whereas benefit, efficacy, attitude, situation management and hygiene practices for the medium concern group, and benefit, barriers and situation management for the low concern group. All concern groups tend to agree it is necessary to

manage bad food practices to promote a healthy life; given this trend, there is a ground basis in stating that adolescents who belong to the high and medium concern groups are more likely to be the ones who will respond to promotional drives against adulterated food because of their greater food safety concern. Therefore, AFM education in school should be observed with emphasis on varying points depending on the food safety concern level.

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