

Prevalence in Food Safety Behaviors of Pregnant Women and Their Associated Factors

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ABSTRACT

Food handling practices play a key role in the prevalence of food-borne illness. Despite the fact that pregnant women are high risk groups for food-borne disease, little is known about their actual food handling practices at home. The objective of this study was to investigate behaviors regarding food-related hygienic practices of pregnant women. The questionnaire included questions in five major areas : personal hygiene ; adequate cooking ; avoiding cross contamination ; keeping food at safe temperatures ; and avoiding food from unsafe sources. Analysis of 488 questionnaires showed the respondents were unaware of the importance of safe food handling practices. Especially, pregnant women in our study should be encouraged to be careful about either risk of adequate cooking (2.08 ± 0.66) and keeping foods at safe temperatures (2.69 ± 0.63). Residency and number of children were consistent independent predictors of food handling behaviors. Previous food safety education also was found to have significant effect on food handling practices. TV news and newspapers were considered the most usable sources of food safety information by respondents. The behaviors identified in this study represent ones of particular importance for high-risk populations, like pregnant women. These population characteristics identified in this study could be incorporated in development of food safety educational programs for pregnant women being vulnerable on food-borne illness. Our results could have implications for the design of effective food safety educational efforts. This study indicates the need for continued and improved food safety education and for enforcing systematic food safety education for pregnant women. (*J Community Nutrition* 7(3) : 141~148, 2005)

KEY WORDS : pregnant women · food safety practices.

Introduction

Along with nutrition concerns, a growing topic of importance is food safety during pregnancy. Pregnant women are at increased risks for getting some food-borne infections because of the hormonal changes that occur during pregnancy. While such changes are necessary for survival of the fetus, they also suppress the mother's immune system, thereby increasing the chance of infection from certain food-borne pathogens (Smith 1999).

Examples of pathogens of special concern to pregnant women are *Listeria monocytogenes*, *Toxoplasma gondii*, *Brucella species*, *Salmonella species* and *Campylobacter*

jejuni. These food-borne pathogens can cause serious illness, including miscarriage, stillbirth, premature labor or severe complications for the baby (FSIS-USDA 2001). Listeriosis is a form of infection that may result when foods containing the bacteria *Listeria monocytogenes* are consumed. *L. monocytogenes* is widely distributed in nature and is found in soil, ground water, plants and animals and has the ability to survive unfavorable conditions, including refrigeration temperatures, food preservatives, and conditions with little or no oxygen (CDC 1992). Pregnant women are 20 times more likely than other healthy adults to become infected with listeriosis. About one-third of listeriosis cases happen during pregnancy. Foods typically associated with listeriosis have a long shelf life and are eaten without further cooking. Outbreaks have involved foods such as unpasteurized milk, raw milk products, raw and smoked seafood, and any ready-to-eat processed foods, that have not been heated to proper temperatures before serving (Silver 1998). Toxoplasmosis, caused by the parasite *Toxoplasma gondii*, can be passed to humans by water, dust,

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soil, or through eating contaminated foods (CDC 2003). Toxoplasmosis most often results from eating raw or undercooked meat, eating unwashed fruits and vegetables, and handling contaminated soil (Smith 1997). Salmonellosis is a common form of food infection that may result when foods containing *Salmonella* bacteria are eaten. The bacteria are spread through direct or indirect contact with the intestinal contents or waste of animals, including humans. *Salmonella* bacteria do not grow at refrigerator or freezer temperatures and are easily destroyed by heating foods to 75°C (CDC 2004). Foods most often involved include raw (unpasteurized) milk and raw milk products, raw or undercooked meat and poultry, raw or undercooked eggs, raw sprouts, salads, and cream desserts and fillings (Scialli 1992).

To avoid infection from these pathogens, pregnant women are advised to practice safe food handling procedures, such as storing all perishable foods at or below 10°C, washing hands and all surfaces, cutting boards and utensils with hot, soapy water and using perishable or ready-to-eat foods as soon as possible. Pregnant women are advised to avoid eating unpasteurized milk and foods made from raw milk, raw or undercooked seafood, refrigerated smoked or precooked seafood, deli seafood salads, hot dogs, luncheon meats, deli meats and pate unless reheated to steaming hot before serving or reformulated to prevent *Listeria* from spreading. Leftover foods should be reheated to 75°C before eating. Fresh fruits and vegetables should be rinsed well before eating, and food such as raw milk and raw milk products, raw or undercooked eggs, raw sprouts, raw or undercooked meat and poultry, and unpasteurized fruit juices should be avoided (Kendall et al. 2003 ; Smith 1999).

Suggested below are key behaviors important in ensuring the safety of the food during pregnancy : 1) practice personal hygiene, 2) cook foods adequately, 3) avoid cross-contamination, 4) keep foods at safe temperatures, 5) avoid foods from unsafe sources. These five major control factors for pathogens are the most effective target of changing those behaviors likely to result in illness (Altekruse et al. 1997 ; Medeiros et al. 2001). Preventing food-borne illness is always important, but is especially so during pregnancy when the consequences can adversely affect the mother and the unborn child. While most of the progress aimed at improvement of food safety has focused on hazard control in primary and secondary production, little attention has been given to food hygiene practices in domestic kitchens, espe-

cially of pregnant women. The relevant literature has failed to find any published studies on the food safety during pregnancy.

Although education is essential in reducing outbreaks of food-borne illnesses that continue to occur among all consumers, there may be targeted audiences including pregnant women, that have special importance for avoiding food-borne illness because of their greater vulnerability to specific pathogens (Medeiros et al. 2001). Since information about pregnant women is needed to identify effective preventive strategies, we conducted a survey to investigate the food handling practices of pregnant women. The objectives of this study are 1) to estimate the prevalence of food handling practices based on five major control factors for pathogens, and 2) to identify the effect of demographic characteristics associated with pregnant women's food safety handling. This study could provide valuable information that will be beneficial in the development of an effective food-safety education program.

Subjects and Methods

1. Sample and data collection

The sample populations are participants at a "Symposium about baby nursing for pregnant women" in Daegu in April 2004. Respondents were surveyed based on willingness to complete a two-page questionnaire. The questionnaires were distributed to 570 people, and 488 usable responses were obtained, giving a response rate of 85.6%.

2. Survey instrument

The instrument was developed to measure the food safety handling practices on the basis of the studies of Medeiros et al. (2001). The survey questionnaire contained twenty questions about current food handling practices categorized by five major control areas : 1) personal hygiene, 2) adequate cooking, 3) avoiding cross contamination, 4) keeping foods at safe temperatures, and 5) avoiding foods from unsafe sources. The respondents were asked to answer the questions using a 5-point scales at 1 : never, 2 : rarely (less than 30%), 3 : some of the time (31 – 70%), 4 : most of the time (71 – 90%), 5 : always (100%). The second part of the survey instrument consisted of nine questions about information sources using 5-point scales at 1 : very unuseful, 5 : very useful. Demographic data and descriptive characteristics on

the subjects were also obtained as the third part.

3. Statistical analyses

Statistical analyses were performed using SPSS 12.0 for Windows (SPSS, Inc., Chicago). In the first stage, descriptive analysis was performed on all measurement items. In addition, frequency analysis was performed to determine overall characteristics of respondents. The answers were stratified into different subgroups based on their demogra-

phic and socioeconomics including age, residency, marital status, income, education level, number of children, and previous educational experience with information of food safety. T-test and ANOVA were computed to compare means of food handling practices by those demographic and socioeconomic characteristics. Stepwise regression analysis was performed to examine the influence of the demographic and socioeconomic characteristics on food handling practices.

Table 1. The demographic characteristics and its effect on food safety handling¹⁾

Characteristics	N ²⁾	Personal hygiene (Mean ± SD)	Adequate cooking (Mean ± SD)	Avoiding cross contamination (Mean ± SD)	Keeping food at safe temperature (Mean ± SD)	Avoiding food from unsafe sources (Mean ± SD)
Overall prevalence	486	3.47 ± 0.65	2.08 ± 0.66	2.84 ± 0.65	2.69 ± 0.63	3.16 ± 0.65
Age (y)						
Under 25	264	3.48 ± 0.63	2.04 ± 0.60	2.78 ± 0.63 ^a	2.69 ± 0.64	3.15 ± 0.67
25 – 30	200	3.42 ± 0.67	2.13 ± 0.75	2.89 ± 0.67 ^a	2.68 ± 0.64	3.17 ± 0.64
over 31	20	3.78 ± 0.42	2.10 ± 0.42	3.35 ± 0.60 ^b	2.78 ± 0.48	3.50 ± 0.31
	<i>F-value</i>	1.470	0.501	3.630*	0.098	1.356
Residency						
Daegu	252	3.58 ± 0.52 ^a	2.15 ± 0.68	2.89 ± 0.72	2.79 ± 0.65	3.26 ± 0.63 ^a
Other cities	172	3.39 ± 0.64 ^{a,b}	2.06 ± 0.65	2.83 ± 0.56	2.62 ± 0.59	3.10 ± 0.68 ^{a,b}
Rural area	54	3.18 ± 1.03 ^b	1.80 ± 0.58	2.62 ± 0.57	2.56 ± 0.57	2.89 ± 0.55 ^b
	<i>F-value</i>	5.484**	2.915	2.011	2.686	4.282*
Marital status						
1 – 4 years	304	3.47 ± 0.63	2.04 ± 0.60	2.78 ± 0.61 ^b	2.65 ± 0.63	3.14 ± 0.65
5 – 8	152	3.47 ± 0.65	2.13 ± 0.71	2.88 ± 0.74 ^{a,b}	2.79 ± 0.62	3.17 ± 0.65
8 and over	22	3.45 ± 0.86	2.31 ± 1.07	3.31 ± 0.37 ^a	2.59 ± 0.62	3.45 ± 0.52
	<i>F-value</i>	0.003	1.181	3.665*	1.367	1.164
Monthly income (million won)						
Under 2	246	3.52 ± 0.59	2.00 ± 0.61	2.71 ± 0.58 ^b	2.60 ± 0.56 ^b	3.09 ± 0.61 ^b
2 – 4	218	3.39 ± 0.71	2.14 ± 0.72	2.93 ± 0.68 ^{a,b}	2.74 ± 0.64 ^{a,b}	3.19 ± 0.67 ^b
4 over	12	3.45 ± 0.29	2.29 ± 0.85	3.75 ± 0.67 ^a	3.70 ± 0.48 ^a	3.95 ± 0.57 ^a
	<i>F-value</i>	1.077	1.502	9.602***	10.285***	5.458*
Education level						
Highschool and below	124	3.45 ± 0.63	1.97 ± 0.59 ^b	2.77 ± 0.66 ^b	2.62 ± 0.63 ^b	3.07 ± 0.65 ^b
College	192	3.46 ± 0.73	2.31 ± 0.82 ^a	2.95 ± 0.63 ^{a,b}	2.83 ± 0.59 ^{a,b}	3.33 ± 0.62 ^{a,b}
University and over	64	3.77 ± 0.64	2.31 ± 0.46 ^a	3.22 ± 0.40 ^a	3.02 ± 0.44 ^a	3.52 ± 0.52 ^a
	<i>F-value</i>	1.400	6.554**	4.099*	4.833**	5.794**
No. of children						
None	142	3.29 ± 0.75 ^b	1.39 ± 0.277 ^c	2.28 ± 0.44 ^c	2.32 ± 0.53 ^c	2.57 ± 0.49 ^c
One	244	3.53 ± 0.54 ^a	2.12 ± 0.38 ^b	2.90 ± 0.56 ^b	2.74 ± 0.56 ^b	3.26 ± 0.47 ^b
Two	78	3.54 ± 0.65 ^a	3.10 ± 0.46 ^a	3.54 ± 0.38 ^a	3.25 ± 0.59 ^a	3.89 ± 0.46 ^a
	<i>F-value</i>	3.275*	249.287***	73.869***	31.753***	97.000***
Previous food safety education						
No	228	3.34 ± 0.64	1.57 ± 0.34	2.43 ± 0.53	2.41 ± 0.52	2.78 ± 0.49
Yes	252	3.60 ± 0.60	2.57 ± 0.54	3.27 ± 0.47	2.98 ± 0.60	3.57 ± 0.58
	<i>t-value</i>	3.181	16.546***	12.609	7.687	11.842

1) T-test and ANOVA were computed to compare means of food handling practices by demographic characteristics.

^{a,b,c} values with different superscripts within a column are significantly different. *** : p<0.001, ** : p<0.01, * : p<0.05.

2) Number of respondents answered applicably was different, because unapplicable answers were treated as missing data.

Results and Discussion

1. Characteristics of respondents

The main characteristics of the study population are presented in Table 1. The mean age was 27.8 years (range of 21–38 years) and all the respondents were married, female, and pregnant. More than half lived in Daegu and almost half reported a monthly family income below 2 million won. Forty-seven percent of the respondents had attained a college and university education level and 30% of the respondents still didn't have their children. When respondents were asked about their previous experience related to food safety education, 48% of respondents reported they had had educational experiences where food safety was discussed.

2. Prevalence of food safety practices stratified by demographic and socioeconomic factors

Overall mean of correct food handling practice was 2.79 ± 0.43 (mean \pm SD) on a 5-point scale with 1 being "never" and 5 being "always". Among five major control areas, the average responses ranged from 2.08 ± 0.66 when asked about adequate cooking to 3.47 ± 0.65 concerning personal hygiene (Table 1).

The results identified the population characteristics associated with each of the categorized food safety behaviors based on the analysis of t-test and ANOVA. Respondents under 25 years scored lower than those who were older than 26 years (F -value = 3.630, $p < 0.05$) on the food safety behaviors relating to avoid cross contamination. The prevalence toward personal hygiene was significantly higher in the urban areas than in rural areas ($F = 5.484$, $p < 0.01$) and for those respondents who had children than for those who did not have a child at home ($F = 3.275$, $p < 0.05$).

The statements of adequate cooking were the lowest among the five major control areas examined. The prevalence of adequate cooking was significantly lower for those respondents who had a less than college level of education compared with those who had an educational level of college and beyond ($F = 6.554$, $p < 0.001$). In addition, adequate cooking was more prevalent among respondents who had children at home compared with those who did not have children ($F = 249.287$, $p < 0.001$) and who had an educational experience discussing food safety compared with those who did not have an experience ($t = 16.546$, $p < 0.001$).

The practices of avoiding the cross contamination were significantly different when analyzing age ($F = 3.630$, $p < 0.05$), marital status ($F = 3.665$, $p < 0.05$), monthly income ($F = 9.602$, $p < 0.001$), education level ($F = 4.099$, $p < 0.05$) and number of children ($F = 73.869$, $p < 0.001$).

Keeping food at safe temperatures was more prevalent among respondents who had higher education ($F = 4.833$, $p < 0.01$) and more children ($F = 31.753$, $p < 0.001$). The prevalence was also significantly higher in the higher income group ($F = 10.285$, $p < 0.001$).

The prevalence of avoiding food from unsafe sources was affected by the factors of where they lived ($F = 4.282$, $p < 0.05$), how much they earned ($F = 5.458$, $p < 0.05$) and educated ($F = 5.794$, $p < 0.01$), and how many had children ($F = 31.753$, $p < 0.001$).

A series of ANOVA revealed that the factor of having children at home was commonly associated with all of the five major food safety practices. Also, age, residency, marital status, income and education level influenced the food safety behaviors during pregnancy. Socioeconomic factors and the educational level of respondents were identified as issues affecting the food safety practices (Sean et al. 1999).

3. Food safety practices of pregnant women in five major areas

The food handling practices of the respondents are shown in Table 2. In regard to the personal hygiene practices, most of them behaved correctly (81.9% of respondents claimed they washed their hands and 73.7% cleaned the countertop with soap and hot running water before preparing foods, 79.1% said they covered a cut or sore hand before preparing food.). However, only 22.2% said they did not prepare meals for others while suffering from an infectious disease like diarrhea. Among major food safety pathogene control factors, washing hands before preparing foods is the most crucial factors associated with personal hygiene (Medeiros et al. 2001). Everyone should be careful to avoid contamination when handling and preparing food, and this is especially important for pregnant women. Thus washing hands well with soap and warm running water before handling food and after using the toilet is strongly recommended. Considering that hand washing is especially important when foods are eaten without heating and fecal contamination is most likely to occur in such cases (Altekruse et al. 1999), it was appropriate that this behavior was ranked first in this study.

Table 2. Pregnancy food handling practices for food safety

Sections	Statements	Never	Rarely	Some of the time	Most of the time	Always	N	Mean ± SD
Personal hygiene	1. I wash my hands with soap and warm running water before preparing food	4(0.8)	22(4.6)	60(12.7)	272(57.4)	116(24.5)	474	4.00 ± 0.79
	2. If I have diarrhea, I don't prepare meals for others	102(21.0)	146(30.0)	130(26.7)	76(15.6)	32(6.6)	486	2.57 ± 1.17
	3. If I have a cut or sore on my hand, I cover it before preparing food	2(0.4)	24(5.0)	136(28.5)	254(53.1)	62(26.0)	478	3.73 ± 0.76
	4. I clean countertop with hot, soapy water before/after preparing	2(0.4)	14(3.0)	108(22.9)	282(59.7)	66(14.0)	482	3.84 ± 0.70
Adequate cooking	1. I use a thermometer to determine if meats have been cooked enough	284(58.7)	102(21.1)	68(14.0)	26(5.4)	4(0.8)	484	1.69 ± 0.96
	2. I use a thermometer to determine if leftovers have been reheated enough	354(73.1)	78(16.1)	44(9.1)	8(1.7)	0(0)	484	1.39 ± 0.72
	3. I heat leftover foods to 75°C before serving	226(46.7)	136(28.1)	72(14.9)	40(8.3)	10(2.1)	484	1.91 ± 1.06
	4. I never eat eggs with a runny yolk or products containing raw eggs	26(5.4)	86(17.8)	142(29.3)	160(33.1)	70(14.5)	484	3.33 ± 1.09
Avoiding cross contamination	1. To refrigerator or freeze the leftovers, I completely wrap up the foods	14(3.0)	54(11.3)	168(35.1)	226(47.3)	22(4.6)	484	3.00 ± 0.78
	2. I wash my hands with soap and warm running water after working with raw meat, chicken, or seafood and before I continue cooking	10(2.1)	64(13.4)	206(43.3)	182(38.2)	14(2.9)	476	3.26 ± 0.80
	3. I wash the plate used to hold raw meat, poultry, or seafood with hot, soapy water before returning cooked food to the plate or I use a clean plate	124(25.7)	102(21.2)	148(30.7)	70(14.5)	38(7.9)	482	2.58 ± 1.23
	4. I do not always wash the fruits and vegetables to be consumed	68(13.7)	150(31.1)	156(32.4)	86(17.8)	22(4.6)	482	2.68 ± 1.06
Keeping food at safe temperature	1. I leave cooked foods on the countertop overnight to be used the next day (R)	18(3.8)	68(14.2)	236(49.2)	146(30.4)	12(2.5)	480	3.14 ± 0.82
	2. I thaw meat products on the counter overnight than in the refrigerator to be used the next day (R)	4(0.8)	40(8.4)	224(47.3)	192(40.5)	14(3.0)	474	3.36 ± 0.72
	3. I refrigerate leftovers immediately (within 2 hours) after a meal is eaten	236(48.6)	150(30.9)	68(14.0)	28(5.8)	4(0.8)	486	1.79 ± 0.94
	4. I check the temperature of my refrigerator or freezer	42(8.8)	148(30.8)	220(45.8)	60(12.5)	10(2.1)	480	2.68 ± 0.88
Avoiding food from unsafe sources	1. I follow label instructions for storing and preparing packaged foods	16(3.3)	80(16.7)	246(51.3)	122(25.4)	16(3.3)	385	3.09 ± 0.82
	2. I discard the food that has passed the expiration date	14(2.9)	34(7.1)	76(15.8)	164(34.2)	192(40.0)	385	4.01 ± 1.05
	3. I serve foods immediately after they are cooked	108(22.3)	170(35.1)	146(30.2)	46(9.5)	14(2.8)	384	2.36 ± 1.01
	4. I never eat raw or undercooked seafood	8(1.7)	54(11.3)	168(35.1)	226(47.3)	22(4.6)	384	3.42 ± 0.81

Scale : 5-point scale from 1 : never, 2 : rarely (less than 30%), 3 : some of the time (30%–70%), 4 : most of the time (71%–90%), 5 : always (100%). (R) means reversed code.

Regarding cooking food adequately, over 93% of respondents indicated they did not use a thermometer to make sure that meat (1.69 ± 0.96) and leftovers (1.39 ± 0.72) were cooked to safe temperatures. Most of the respondents (89.7%) ignored whether leftover foods were heated to 75°C before serving (1.91 ± 1.06). Seventy-six percent of the respondents were unaware of the potential risks associated with eating raw eggs (3.33 ± 1.09). The risk of in-

sufficient reheating may be greater because cooked and chilled foods frequently were just warmed up rather than thoroughly heated (Bryan 1988). Leftovers containing meat or chicken must be reheated thoroughly (e.g. 65.5 – 80°C for minutes) to kill vegetative forms of pathogens (Bryan 1988). While meats, poultry and eggs are important foods for a healthy diet, pregnant women should avoid eating raw or undercooked ones because these can increase their risk

of a number of foodborne illnesses (including Listeriosis, E. coli and Campylobacter infections, Salmonellosis and Toxoplasmosis). Since cooking foods adequately is the only means available for consumers to kill pathogens on these foods (Medeiros et al. 2001), educating those who are pregnant to cook foods adequately is important. The use of a thermometer also should be encouraged.

According to the result of avoiding cross contamination, our respondents said they washed their hands with soap and warm running water after working with raw meat, chicken, or seafood and before they continue cooking (3.26 ± 0.80). Our respondents were in agreement whether washing hands before and after handling raw food belonged under the area of 'Personal hygiene' and 'Avoiding cross contamination'. However, only 25.7% of respondents showed that they used the same kitchenware, without cleaning, to prepare raw food (2.58 ± 1.23) and 22.4% of respondents did not wash the fruits and vegetables to be consumed appropriately (2.68 ± 1.06). This indicated that these respondents did not understand the importance of avoiding cross contamination during home food preparation.

Regarding keeping food at safe temperatures, the respondents indicated that they left (82.1%) or thawed (90.8%) foods at room temperature. The process of thawing frozen items is not particularly hazardous. However, if thawed foods remain at room temperature for a long time, microorganisms can multiply. If foods that are incompletely thawed are sometimes cooked insufficiently to kill pathogens, it may result in the outbreak of food borne disease. Moreover, 93.5% of respondents did not store foods in the refrigerator within 2 hours after meals and 85.4% did not check the temperature of the refrigerator and freezer. Since the risk increases with the span of time elapsing between cooking foods and their consumption, it is recommended that food should be kept at room temperature for as short a time as possible and certainly not longer than two hours (Williamson et al. 1992).

Some foods have a high enough probability of being contaminated with pathogens or toxins that their consumption is not advised (Cromeans 1997). Because the consumption of these products in their raw or undercooked form leads to outbreaks, avoidance should be taught in educational programs, especially for high risk groups like pregnant women. Seafood is an example of food where ensuring quality is recommended; half of the respondents in our study said they did not eat raw or undercooked seafoods. Seventy-one per-

cent of respondents did not follow label instructions for storing and preparing packaged foods (3.09 ± 0.82) and 77.7% did not follow handling food safely, namely the operational 2-hour guidance (2.36 ± 1.01).

4. Sources of food safety information

When asked about the sources for food safety information, respondents said they would benefit from home food safety education, including TV news (79.7%), newspapers (71.9%), TV programs about cooking (65.9%), and periodicals (59.2%) (Table 3). Effective communications of food safety with doctors (40.1%) and with dieticians (6.5%) were identified as a channel for gathering information. Other sources of food safety information are as follows: family, food or cooking courses, and the internet. Previous researches have indicated that consumers obtain information on food safety from consumer reports and science magazines, television, and print media (Bruhn et al. 1992; Bruhn, Schutz 1999).

5. Multiple regression analysis for variables predicting overall food safety practices

The influence of independent variables which were significantly associated with the overall food safety practices are shown in Table 4. Results of multiple regression analysis showed that age, marital status, income, and education level were not predictors of food safety practices of respondents. However, residency and number of children influenced the respondents' overall food safety practices. In addition, educational experiences including information about food safety positively affected the practices related to food safety, so many respondents could benefit from food safety education. These population characteristics identified in this study could be incorporated in the formulation and implementation of

Table 3. Sources of information for the food safety

Variables	Respondents	
	Number ^a	%
Newspaper	351	71.9
TV news	389	79.7
TV program about cooking	322	65.9
Periodicals	289	59.2
Internet	78	15.9
Food or cooking courses	85	17.4
Family	124	25.4
Doctor	196	40.1
Dieticians	32	6.5

^aRespondents could choose all that applied

Table 4. Summary of multiple regression analysis for variables affecting pregnancy food handling practices

Variable	B ^a	SE B ^b	B ^c	R2
Dependent Variable : Overall food handling practices				0.676
Residency*	0.051	0.025	0.082	
Number of children***	0.313	0.034	0.518	
Previous education having food safety information***	0.286	0.047	0.347	

Note : For the stepwise regression analysis, composite items of age, residency, marital status, income level, education level, number of child, and education experience related food safety were used.

^aUnstandardized coefficients, ^bStandard error of unstandardized coefficients, ^cStandardized coefficients

***p<0.001, *p<0.05.

educational programs aimed at the changes of the food safety practices. Previous studies (Klontz et al. 1995 ; Sean et al. 1999) reported that demographic factors were associated with a number of food handling practices.

Summary and Conclusions

The data obtained from this study has provided some information on food safety awareness and hygienic food preparation practices of pregnant women. Although the importance for food safety practices have been emphasized, many respondents reported not following recommended safe food handling practices always, such as using a food thermometer, safely handling leftovers, and immediately refrigerating leftovers. Furthermore, considering the gap between the stated (self-reported) and actual behavior, some respondents are still unknowingly practicing some unsafe behaviors. Educational intervention should emphasize the importance of adequate cooking and keeping food at safe temperatures. The relationships between food safety practices categorized by five major areas and demographic characteristics of respondents were identified. Rural residents and those who did not have a child and lesson with food safety were more likely to report unsafe food handling practices. The results suggest that efforts to educate respondents on desirable food handling practices should focus on rural residents and those who did not have a child in Daegu and Gyeongsangbookdo. TV news and newspapers were considered the most practical sources of food safety information. Results indicated that, with the fact that quality attributes are independent, it is important to incorporate food safety information in an everyday context.

The educational effort should continue until most of the pregnant women acknowledge the health risk associated with food handling behaviors. Education experience with lessons discussing food safety has been found to be associated positively with safe food handling behaviors, so educating the pregnant women would establish safe food handling practices and avoid the food-borne disease. Our study could help develop effective educational programs that aim at changing food safety behaviors. The results suggest efforts to develop and reinforce food safety educational program for pregnant women. Food safety education is most effective when messages are targeted toward changing behaviors most likely to result in food-borne illness.

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