

Food Refrigeration Knowledge, Attitudes, and Practices among Undergraduate students at Ryerson University: A Cross-Sectional Study

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Purpose

- Inadequate refrigeration during food storage can support the growth of pathogens, exposing people to food safety risks¹
- Previous studies have found that university students often have poor safe food handling practices²
- Students living in university residence halls often have personal or shared refrigerators for food storage and are often living alone and handling food for the first time in their lives. Therefore, an investigation of their safe food storage practices is important to help prevent food-borne illness in this population.

Objectives

- To determine the food storage knowledge, attitudes, and practices related to refrigeration among students living in residence hall on campus
- To explore relationships between socio-demographic variables and outcomes

Methods

- We carried out a cross-sectional study by administering a face-to-face paper questionnaire about safe food knowledge, attitudes, and practices to undergraduate students (n=93) living in two residence halls on campus
- Demographic variables, knowledge, attitude, and practice responses were tabulated using summary measures (e.g. frequencies and mean)
- Associations between socio-demographic variable and respondents' knowledge, attitude, and practice scores were evaluated using t-tests and one-way analysis of variance (ANOVA), as appropriate
- Pairwise Pearson correlations were calculated to evaluate the association between respondents' food storage knowledge, attitude, and practice scores
- A statistically significant difference was determined at $p < 0.05$
- Informed consent was obtained from all participants before proceeding with the survey
- The study received ethical approval from the School of Occupational and Public Health Departmental ethics board



Results

Table 1. Knowledge scores of student respondents (n = 93), stratified by socio-demographic variables ($p < 0.05$)*

Demographic Variables	Total No. (%)	Mean Score	95% CI	t or F value	p-value
Age (years)					
18	57 (62.6)	3.12	2.82, 3.42	0.58	0.566
19 or older	34 (37.4)	3.26	2.87, 3.66		
Gender					
Male	49 (53.3)	3.33	2.99, 3.67	1.09	0.278
Female	43 (46.7)	3.07	2.74, 3.40		
Ethnicity					
White (Caucasian)	49 (53.8)	3.51	3.23, 3.79	2.63	0.0103*
Other	42 (46.2)	2.90	2.54, 3.27		
Born in Canada					
Yes	53 (57.6)	3.34	3.03, 3.65	1.31	0.194
No	39 (42.4)	3.03	2.65, 3.40		
Faculty of study					
Arts	12 (13.2)	3.33	2.68, 3.99	0.85	0.521
Comm. & Design	33 (36.3)	3.36	2.97, 3.76		
Community Service	5 (5.5)	3.20	2.18, 4.22		
Engineering	16 (17.6)	3.00	2.43, 3.57		
Management	22 (24.2)	2.91	2.42, 3.39		
Science	3 (3.3)	4.00	2.69, 5.31		
Food service experience					
Yes	43 (46.7)	3.37	3.03, 3.69	1.61	0.111
No	49 (53.3)	3.00	2.66, 3.34		

Table 2. Attitude scores of student respondents (n = 93), stratified by socio-demographic variables ($p < 0.05$)*

Demographic Variables	Total No. (%)	Mean Score	95% CI	t or F value	p-value
Age					
18	57 (62.6)	3.79	3.67, 3.90	0.41	0.685
19 or older	34 (37.4)	3.83	3.68, 3.97		
Gender					
Male	49 (53.3)	3.78	3.68, 3.90	-0.16	0.870
Female	43 (46.7)	3.80	3.64, 3.96		
Ethnicity					
White (Caucasian)	49 (53.8)	3.82	3.67, 3.96	0.74	0.472
Other	42 (46.2)	3.75	3.63, 3.86		
Born in Canada					
Yes	53 (57.6)	3.70	3.57, 3.83	-2.29	0.0298*
No	39 (42.4)	3.90	3.78, 4.02		
Faculty of study					
Arts	12 (13.2)	4.01	3.76, 4.26	1.70	0.144
Comm. & Design	33 (36.3)	3.85	3.70, 4.00		
Community Service	5 (5.5)	3.46	3.08, 3.85		
Engineering	16 (17.6)	3.69	3.47, 3.90		
Management	22 (24.2)	3.70	3.52, 3.89		
Science	3 (3.3)	3.92	3.42, 4.42		
Food service experience					
Yes	43 (46.7)	3.88	3.75, 4.00	1.78	0.070
No	49 (53.3)	3.71	3.58, 3.85		

Figure 1. Food storage Knowledge, attitude and practice scores by Ethnicity

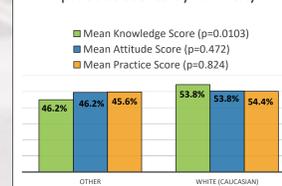
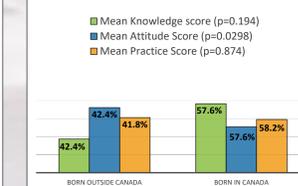


Figure 2. Food storage knowledge, attitude and practice scores by birth place



Questions	Knowledge (Correct Response)	Attitude ('Agree' or 'Strongly Agree')	Practices ('Often' or 'Always')
What is the Max temperature refrigerators should be to preserve the safety of foods?	56.7%	-	-
Refrigerator running at recommended temperature is essential for maintaining food safety	-	96.8%	-
Verifying refrigerator temperature using a thermometer?	-	-	3.3%
Chilling or freezing eliminates harmful germs in food	55.9%	-	-
Smell and appearance of food means that you can tell if it is safe to eat	-	43.1%	-
How often do you use the smell and appearance of refrigerated food to tell if it is still safe to eat?	-	-	64.1%

Limitations

- A purposive sample of students living in residences was obtained and may not be representative of all undergraduate students at Ryerson University
- We intended to conduct an observation of students' refrigerators to compare with their self-reported practices. However, most students were uncomfortable with the idea, and they declined this part of the study

Conclusions

- The results of this survey show that undergraduate students have some key knowledge, attitude, and practice gaps related to food storage
- Most importantly, proper use of refrigerator food storage technique seems to be lacking in some areas
- We found non-Caucasians and Canadian-born individuals being deficient in knowledge and attitudes, respectively
- The use of myths and the negative consequence on food safety is evident as almost half of the study population reported using the smell and appearance of food as a basis for determining if food is safe to eat, which poses a risk for foodborne illness
- Targeted messaging on food refrigeration storage and the need to create a specific food storage education to dispel food safety myths will benefit the student population

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