

Effect of Health Teaching Program on Food Hygiene Locus of Control and Self-efficacy among Community Dwelling Older Adults

Ola Gouda Mohamed Elshiekh⁽¹⁾, Ola Ezzat Eltohamy Mohamed⁽¹⁾,
Nermeen Mahmoud Abd El-Aziz⁽²⁾

(1) Lecturer of Gerontological Nursing, Faculty of Nursing, Damanhour University, (2) Assistant Professor of Gerontological Nursing, Faculty of Nursing, Assuit University.

Corresponding author: olaelshiekh@yahoo.com

Abstract

Background: Locus of control is serious to which older adults view their attainment of safe food hygiene within their own control internal or external determined by their beliefs regarding personal responsibility. Improving the knowledge regarding foodborne illness and food hygiene for the older adults through health teaching program affect their belief and confidence that influence the personal ability to the recommended food hygiene. **Aim:** Is to investigate the effect of health teaching program on food hygiene locus of control and self-efficacy among community dwelling older adults. **Research design:** A quasi-experimental design was utilized to accomplish this study. **Settings:** The study was carried out in the central health insurance clinics at Assiut Governorate, Egypt (medical, diabetic, chest, and cardiology clinic). **Subjects:** Eighty female older adults from the previously mentioned settings were selected according to the following inclusion criteria; aged 60 years and above, able to communicate effectively, attending the previously mentioned settings during the time of data collection, and willing to participate in the study. **Tools: Five tools were used for data collection:** Older adults' health status and socio – demographic data, Food Hygiene Locus of Control scale, Food Hygiene Self-efficacy scale, Food Hygiene related knowledge scale and Food Hygiene related practice questionnaire. **Results:** all the studied female older adult's Food hygiene locus of control, self- efficacy related to knowledge and practice improved and achieved a highly statistically significant differences after the implementation of the food hygiene teaching program than before. **Conclusion:** Food hygiene locus of control, self-efficacy related to knowledge and practice among all the studied female older adults improved after the implementation of the food hygiene teaching program **Recommendations:** Raising the awareness about the importance of practicing food safety and hygiene by conducting a food hygiene campaign towards different age groups. Also, should be cultivated from early education by including it into the national curriculum.

Keywords: Food Hygiene, self-efficacy, locus of control, Older Adult

Introduction

Food hygiene is vital for preparing and providing safe food that contributing to a healthy and productive society. Food Hygiene, otherwise known as Food Safety that can be refers to handling, preparing and storing food in a best practices to reduce the risk of the food-borne disease (FBD) that is caused by microbial pathogens (Al-Sakkaf, 2015).

Foodborne disease remains a significant public health problem both in developed and developing nations. An estimated that 600 million people, almost 1 in 10 people in the world, fall ill annually from consuming contaminated food among these cases, children and older adults are the most affected, and 420 000 deaths (WHO, 2015a).

According to Havelaar et al. (2015), Egypt is one of WHO Eastern Mediterranean region which is categorized

as having the third-highest estimated burden of FBDs per population. Annually an estimated 100 million people living in this region fall ill with an FBD illness. Salmonella, Escherichia coli (E. coli), norovirus, and Campylobacter account for 70% of the burden of FBD in this region.

With the development of medical technology and improvement in healthy lifestyles, the human average life span beings to increase; therefore, the number of elderly people is also increasing. In Egypt, the percentage of elder people in 2017 was 6.9% and it is expected to rise to 11.5% in 2031. The expected increase of total population from 1996 to 2026 is about 57% while throughout the same period the expected increasing rate among older individuals is about 79% (Central Statistical Processing Center, 2017).

In this regard, unsafe food hygiene poses global health threats, Although everyone is

susceptible for food poisoning but also infants, young children, pregnant women, older persons and individuals with a weakened immune system such as HIV infection, liver disease or who are on cancer treatment are particularly vulnerable. Their bodies' ability to fight germs and sickness is not as effective for a variety of reasons (Yap et al., 2016).

The older adult can suffer more acute symptoms from food poisoning. Not only do they contract foodborne illnesses at a higher rate than other segments of society, they are also more likely to need extensive medical attention because of it (CDC, 2019). This increased risk of foodborne illness is because their slower immune systems and digestion systems makes it hard to get rid of the bacteria, the liver and kidneys may not properly rid the body of foreign bacteria and toxins, the stomach may not produce enough acid to reduce the number of bacteria in intestinal tract. Moreover, older adult are more likely to have a chronic diseases, as diabetes, arthritis, cancer or cardiovascular disease, and increasing use of over the counter medications daily to treat this conditions, can weaken the immune system and increase the chance of bacterial infection (CDC, 2019).

Furthermore, older adults' senses of taste, smell and poor eyesight are sometimes affected, they are often less able to tell when food is not safe to eat, making them more likely to eat contaminated food (National Health Insurance Service, 2015; Brocklehurst et al., 2017).

In particular, Food hygiene is important for everyone, but it's especially important for older adults to protect themselves from foodborne illness. In this respect, Food hygiene is more than just cleanliness. The way in which food is handled, prepared and stored are equally important part of food hygiene (Kendall et al., 2013). Food hygiene preventing any microorganisms present from multiplying to an extent that

would cause illness of consumers or the early spoilage of the food and destroying any harmful microorganisms in the food by thorough cooking, avoid cross-contamination, avoid foods from unsafe sources, keeping foods at safe temperatures, rejecting and discarding spoiled and contaminated foods (Wright et al., 2011; WHO, 2015b; Evans & Redmond, 2016).

Likewise, it is more importantly for elderly to understand food hygiene risk so that they can practice safe food handling behaviors. In order to change, people have to perceive that their current behavior threaten their health and that taking a strong action for reducing their risk. Also, perceptions and beliefs are shaped by knowledge, which in turn affects the willingness to change the current practices.

Consequently, Locus of control is a construct that may assist in understanding learners' beliefs regarding their personal responsibility and ability to influence their own health. Moreover, Self-efficacy is a psychosocial construct, points out to an individual's confidence in his or her ability to perform a recommended health behavior or abstain from an unhealthy behavior. (Grembowski D et al., 2014)

Along with this, the older adults should be supported through the development of food hygiene teaching program to reduce the risk of food poisoning by presenting the importance of food hygiene, food poisoning bacteria, food poisoning symptoms, selection tips for food storage temperature, tips on purchasing food, safe cooking, food requiring special care, eating out and delivery instructions for handling food are explained in detail (Murray et al., 2017). This knowledge will increase the older adults' confidence in his or her ability to perform a recommended food hygiene healthy behavior) or abstain from an unhealthy behavior. Furthermore, the gerontological health nurse can play an important role in increasing the awareness of older population regarding food hygiene

and preventing the wide spread of foodborne illness among them through developing successful food hygiene health teaching programs (WHO, SHJMUN; 2015c; Emirates News Agency, 2017).

Significance of the study

The occurrence of outbreaks of food borne illness continues to be widespread and constitute an essential health problem. It is serious and potentially life-threatening for older adults.

Locus of control is important to which older adults view their attainment of safe food hygiene handling and practices within their own control internal or external determined by their beliefs. Moreover, self-efficacy scale shows the necessity to raise the older adult's confidence in their ability to perform the recommended food hygiene behavior. So, improving the knowledge regarding food hygiene for the older adults through health teaching program adhering them to the recommended food hygiene.

Aim of the study

Is to investigate the effect of health teaching program on food hygiene locus of control and self-efficacy among community dwelling older adults.

Research hypotheses:

1. Community dwelling older adults who received the food hygiene health teaching program will improve the locus of control and self-efficacy related knowledge.
2. Community dwelling older adults who received the food hygiene health teaching program will improve the locus of control and self-efficacy related practices.

Materials and Method

Materials:

Research design:

A quasi-experimental design was utilized to accomplish this study.

Setting:

The study was carried out in the central health insurance clinics at Assiut Governorate, Egypt (medical, diabetic, chest, and cardiology clinic).

Subjects:

Female older adults (80) from the previously mentioned settings were selected according to the following inclusion criteria; aged 60 years and above, able to communicate effectively, attending the previously mentioned settings during the time of data collection, and willing to participate in the study.

Sampling technique:

- A convenient sample of 370 female older adult aged 60 years and above, were screened by using food hygiene related knowledge scale, those female older adult who had low level of them were included in food hygiene teaching program. They were 80 female olderadults.

Sample size:

The sample size was estimated using Epi info 7 statistical program using the following parameters; total population (female older adult attending the previously mentioned settings) 9000, prevalence of the problem 50%, confidence level 95% with 5% margin of error. The minimum sample size estimated to be 368 women. The final sample size was 370 female older adult for possible non-response.

Tools of the study:

Five tools were used for data collection:

Tool (I): Older adults' health status and socio – demographic data:

It was developed by the researchers based on relevant literature (Roy et al., 2016; Choi et al., 2018) to collect information from the study subjects. It comprised two parts:

Part 1: it included 7 items related to the older adults' personal and socio-demographic data: age, level of education, income sufficiency, marital status, occupation, family type, meal preparation.

Part 2: it comprise 2 items: perceived health status and the current health problems.

Part 3: it involve 2 items: who prepares and cooks in family and the older adults' source of information of about food hygiene related knowledge and practice such as parent, friends, doctors, TV, internet and social media.

Tool (II): Food Hygiene Locus of Control scale:

This scale was modified by (Byrd-Bredbenner et al., 2007a; Byrd-Bredbenner et al., 2007c) to measure the degree to which an individual believes food hygiene (avoidance of food poisoning) which is controlled by internal factors (that is, largely under a person's own control) or external factors (that is, largely under the control of powerful others or determined by luck or chance factors) (Brown, 1999).

Scoring system

This scale contained three subscales (i.e., internal, external: powerful others, and external: chance) with a total of 12 Likert-type items, scored on a six point Likert scale (1=strongly disagree, 2= disagree, 3= slightly disagree, 4= slightly agree, 5 = agree, and 6 = strongly agree). The score for each scale, was computed by summing the score of each statement and dividing by the number of the statement in the scale. Then, the total score of the locus of control scale was computed by summing the score of each subscale. It distinct between (18 – 108). Cronbach alpha coefficients for the internal, external: powerful others, and external: chance scales, was 0.63, 0.63, 0.59 respectively.

Tool (III): Food Hygiene Self-efficacy scale:

It was developed by Byrd-Bredbenner et al. (2007a) to measure the individual's

confidence in his or her ability to perform specific recommended food handling [food poisoning prevention] behaviors. It is thought to influence which health behaviors will be initiated, the degree of effort expended, and the persistence of the behavior. High self-efficacy scores frequently are associated with the more advanced stage of change status and greater readiness to change.

Scoring system

This scale include 24 Likert-type items; it was scored on a five point Likert scale (1= I am sure I could not do it, 2= I could not do it, 3= I don't know if I could do it, 4= I could do it, and 5 = I am sure I could do it). The total score of self-efficacy scale was computed by summing the score of each statement and divided by the total number of statements on the scale (the total score 103–120). The Cronbach alpha coefficient for self-efficacy scale was 0.93.

Tool IV: Food Hygiene related knowledge scale:

This scale was developed by Byrd-Bredbenner et al. (2007b). It was adapted by the researcher to assess the older adults' knowledge of food hygiene concepts, ranging from food purchasing to preparation to storage and facilitate the identification of specific knowledge deficit to be targeted later in educational interventions. The final criterion-referenced questionnaire contains four main subscales: (i) Cross contamination prevention & disinfection procedures, (ii) Safe times/temperatures for cooking/storing food, (iii) Groups at greatest risk for foodborne disease, (iv) Foods that increase risk of foodborne disease.

Scoring system

The total items of this scale were scored by awarding one point for each correctly answered question and zero for the wrong answer. So, the total scores range from 0 to 77. A 50% as the cut-off passing score. The total knowledge score was classified into poor knowledge (score 0–45), fair knowledge (score 46–61) and good knowledge (score 62–

77) to assess knowledge. The reliability of food hygiene knowledge scale as computed by Livingston's coefficient for criterion-referenced tests **Shown in the following table.**

Subscales	Item type		Possible points	Livingston Reliability Coefficient ^c
	Multiple choice	Dichotomous answer series ^a		
Cross contamination prevention & disinfection procedures	9	2 (with a series of 20 answers)	0 to 29	0.952
Safe times/temperatures for cooking/storing food	11	0	0 to 11	0.881
Groups at greatest risk for foodborne disease	1	1 (with a series of 8 answers)	0 to 9	0.978
Foods that increase risk of foodborne disease	2 ^b	1 (with a series of 26 answers)	0 to 28	0.902
Total	23	4 (54 answers)	0 to 77	0.977

^a a question followed by a series of answers, with each answer requiring a response of correct or incorrect, ^b One item was true/false, ^c The calculation was computed using 50% as the cut-off passing score.

Tool V: Food Hygiene related practice questionnaire:

It was developed by the researchers based on literature review to assess the older adults' food hygiene related practices (Yap et al., 2016, Evans & Redmond, 2016).

Scoring system

It consisted of 48 statements, classified into food purchasing (8), food storage (16), personal hygiene (6), food preparation (7), food cooking (6), food reheating (3), food cooling (2) with two responses [correct answer = (1), and wrong answer = (0)]. Thus, the total score was range from 0 to 48. A 50% as the cut-off passing score. The total score of practice questionnaire (0–48) distinguished between poor practice (score 0–28), fair practice (score 29–38) and good practice (score 39–48) to assess the food hygiene related practice. The Cronbach alpha coefficient for food hygiene related practice questionnaire was 0.981.

Method:

The study was executed according to the following steps:

Administrative Process

- Approval of responsible authorities was obtained through official letters from the Faculty of Nursing.

- Meetings were held with the directors of the selected setting to clarify the purpose of the study and to gain their cooperation and support during data collection.

Study Tool

- Tool (I, V) was developed by the researchers after reviewing the recent relevant literature, and tool (IV) was modified by the researcher, all of them were validated by juries of (5) experts in the field. Their suggestions and recommendations were taken into consideration. Tool (II, III) was developed by Byrd-Bredbenner et al. (2007a).
- Livingston Reliability, and Cronbach Alpha Coefficient was used to ascertain the reliability of the study tools as mentioned before (tool I, V, IV).

Pilot Study

- Was carried out on 10% (8) female older adults who were randomly chosen from the previously mentioned setting and were not included in the sample in order to ascertain the relevance, clarity and applicability of the tools, test wording of the questions and estimate the time required for the interview. Based on the obtained results, the necessary modifications were done.

Food hygiene health educational program related knowledge and practice:

I-Preparation phase:

- Initial assessment of each female older adult in the previously mentioned setting using personal and socio – demographic data, Food Hygiene Locus of Control scale, Food Hygiene Self- efficacy scale, Food Hygiene related knowledge scale, and practice questionnaires were carried out before applying the teaching program.

II- Developmental phase:

- Based on the results of initial assessment and the review of related literature, the health teaching program was developed, the objective of food hygiene program was established to

improve female older adults' food hygiene knowledge and practice.

- Various educational methods were used in the form of group discussion, slide shows, and short lectures. The teaching materials that were used e.g. booklets, and pamphlets.

III- Implementation Phase:

- During the implementation phase, females older adult were divided into 8 groups (10 females per each group). The health educational program was implemented in 2 sessions, 2 times /week for 8 weeks. Each group of females' older adult attended 2 sessions. Each session took 45 minutes, Firstly, discussion of the session objectives and content were dedicated. Then time was available for females' participation and interaction. Each session was followed by a summary of knowledge and practices presented about food hygiene. Different methods of instructions and teaching aids mentioned before were used.
- The first session consisted of the main information aspects of food hygiene included: its definition, importance, the basic rules for food hygiene, definition of food poisoning and the contributing factors of food poisoning (foodborne illness). The types and general signs and symptoms of food poisoning. The highly susceptible population of food poisoning. Why some foods are risky, how to reduce risk for some foods by reheating, and substitutes for risky foods.
- **The second session** consisted mainly of the best food hygiene practices related to food purchasing, storage, preparation, personal Hygiene, food cooking, reheating, cooling and preventing cross-contamination.
- The researcher conducted this program at the central health insurance clinics using different methods of teaching such as discussion, brain storming, also using booklet and pamphlets during the session.

IV- Evaluation phase:

- In the present program the females' older adult were evaluated to determine the extent to which they have obtained the desired knowledge and practiced it.
- Evaluation of the females' before the program was done in the form of pretest given to them using tool II, III, IV, V. At the end of the program, a post test was carried out using the same tools as in pre-test. Post tests were conducted twice, immediately after the end of the program and one month later to evaluate the immediate and retained changes in the female older adults.

Data Collection

- Data was collected by the researchers during the period from the beginning of March 2019 to till the end of August 2019.

Statistical Analysis

Statistical analysis of the data

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp) Qualitative data were described using number and percent. Kolmogorov- Smirnov test was used to verify the normality of distribution Quantitative data were described using range (minimum and maximum), mean, standard deviation, median. Significance of the obtained results was judged at the 5% level.

The used tests were

- **Friedman test**
For abnormally distributed quantitative variables, to compare between more than two periods or stages
- **Spearman coefficient**
To correlate between two distributed abnormally quantitative variables
- **Regression**
To detect the most independent factor for affecting knowledge and practice and self-efficacy and locus of control

- **Reliability Statistics**

Reliability Statistics was assessed using Cronbach's Alpha test and Livingston Reliability Coefficient

Ethical Considerations

- Informed oral consents were obtained from the females' older adult after brief explanation of the purpose and nature of the research.
- Confidentiality of the collected data, privacy and anonymity of the study subjects and the right to withdraw at any time was assured.

Results:

Figure 1: represents the distribution of the studied female older adults according to their socio-demographic data that the age of the female older adults ranged from 60 to more than 70 years with a mean of 64.61 ± 3.87 . Furthermore, less than two third (63.8%) of them were married. In addition, less than half of them (46.3%, 40.0% respectively) had university and secondary educational level respectively whereas (7.5%) of them are able to read and write. Moreover, more than two thirds of the female older adults (68.8%) were unemployed after retirement. Also, less than three quarter of them (72.5%) stated that they had insufficient income.

Figure 2: shows that more than half of the studied female older adults (53.8%) had neutral perceived health status, around two thirds of them (65.0%) had a vision problem, more than half of them (52.5%) had a hearing problems and more than one third of them had (35.0%) reported a diabetics diseases.

Figure 3: Illustrate that more than three quarters of the female older adults prepares and cooks the food by their own (83.8%) and had information about food hygiene, mainly through internet and social media (76.3%).

Table (1): reveals the distribution of the studied female older adults according to their mean scores of food hygiene related knowledge subscales. Concerning the cross

contamination prevention/disinfection procedures, the mean score were ($M \pm SD = 3.34 \pm 4.02, 13.88 \pm 4.57, 12.25 \pm 4.07$, respectively) in the pre, post, and follow up program.

The difference is statistically significant between three phases as ($p_1 < 0.001, p_2 < 0.001, p_3 = 0.018$) and between the means as ($Fr = 89.108, p < 0.001$). Regarding the safe times/temperatures for cooking/storing food, the mean score were ($M \pm SD = 4.51 \pm 3.45, 8.14 \pm 3.36, 6.99 \pm 2.80$, respectively) in the pre, post, and follow up program, with a statistically significant difference between the both means as ($Fr = 37.652, p < 0.001$) and between three phases as ($p_1 < 0.001, p_2 = 0.003, p_3 = 0.004$). The same was noticed in relation to foods that increase risk of foodborne disease, where a statistically significant difference was found ($Fr = 114.525, p < 0.001$) between the both means in the pre, post, and follow up program, also between phases as ($p_1 < 0.001, p_2 < 0.001, p_3 = 0.133$). The table also reveals a statistically significant difference with regard to groups at greatest risk for foodborne disease mean score ($Fr = 86.558, p < 0.001$), else between three phases as ($p_1 < 0.001, p_2 < 0.001, p_3 = 0.001$).

Table (2): explored that the majority of the female older adults (91.3%) had poor food hygiene related knowledge before program implementation. While, they achieved a good score (78.8%) of Knowledge level immediately after application of the program. Then, it lessened to (67.5%) in the follow up phase after one month with a highly statistically significant difference between the three phases ($Fr = 106.246, P < 0.001$).

Table (3): indicates that there was a significant effect of the health teaching program on the studied female older adults' own control regarding the internal locus of control in the preprogram, post program and follow up showed by the difference between the means score as ($7.98 \pm 3.24, 14.75 \pm 4.55$,

14.21 ± 4.99). Else, reported by (Fr =57.740, p<0.001). The table also demonstrates the studied female older adults' preprogram, post program and follow up means score, concerning to food hygiene external locus of control as (12.72 ± 12.72, 19.49 ± 5.15, 18.98 ± 5.54) with a statistically significant difference indicated by (Fr =69.713, p<0.001). As well the results revealed a significant effect of health teaching program on the studied female older adults' beliefs regarding chance locus of control in the pre, post program and follow up means score with (12.93 ± 4.75, 23.10 ± 7.86, 23.04 ± 7.82) where (Fr =67.415, p<0.001).

Table (4): displays that the studied older adults' food hygiene related self- efficacy mean was (50.69 ± 21.92) before the implementation of the program, raised to (97.13 ± 30.81) immediately after the program implementation. But it slightly dropped to (96.76 ± 24.92) after one month follow of the program with the difference is statistically significant between them as reported by (Fr =92.872, p<0.001).

Table (5): reveals the distribution of the studied female older adults according to their mean scores of food hygiene related practices. It was noticed that they were achieved a total mean score of food hygiene related practices comprise food purchasing, storage, personal Hygiene, preparation, cooking, reheating and cooling as (12.05 ± 8.46) before the implementation of the program. While, immediately post program, it raised to (36.91 ± 11.84) however, in the follow up phase, it reached (34.41 ± 10.81) with a statistically significant difference between the three phases (p1<0.001, p2<0.001, p3<0.001) else, with a highly significant difference between the scores as (Fr =126.465, p <0.001).

Table (6): the table shows that before program implementation, the vast majority of

the studied female older adults had poor food hygiene related practices (92.5%). it is increased to (60.0%) of them had achieved a good practices level immediately post program, but it dropped to (51.3%) after one month follow up phase with a statistically significant difference between them (Fr = 89.812, P=<0.001).

Table (7): portrays the association between socio-demographic factors and the studied female older adults' food hygiene knowledge, locus of control, self-efficacy and practice. It was explained by using binary logistic regression that the most socio-demographic factors make the female older adults more fold with poor knowledge as the dependent variable, were the age range from 65 to more than 70 years with (OR 12.105, 12.757, P=0.047, 0.019 respectively), and the preparatory education with (OR 32.783, P=0.036). The table also reveals that married couple and second generations' family were good protective locus of control behaviors with (OR 0.045, 0.010, P=0.049, 0.017 respectively). While poor health status make them more fold with low locus of control as the dependent variable (OR 23.403, P= 0.030). Moreover, the age range from 65 to more than 70 years and married couple' family with (OR 50.369, 55.691, 56.855, P=0.002, 0.004, 0.022 respectively) were make the female older adults more fold with low self-efficacy as the dependent variable. However, the single status was good protective of self-efficacy behaviors with (OR 0.001, P=0.010). Finally, the most socio-demographic factors that make the female older adults more fold with poor practice as the dependent variable, were the divorced status and preparatory education level with (OR 23.185, 34.122, P=0.035, 3.530 respectively).

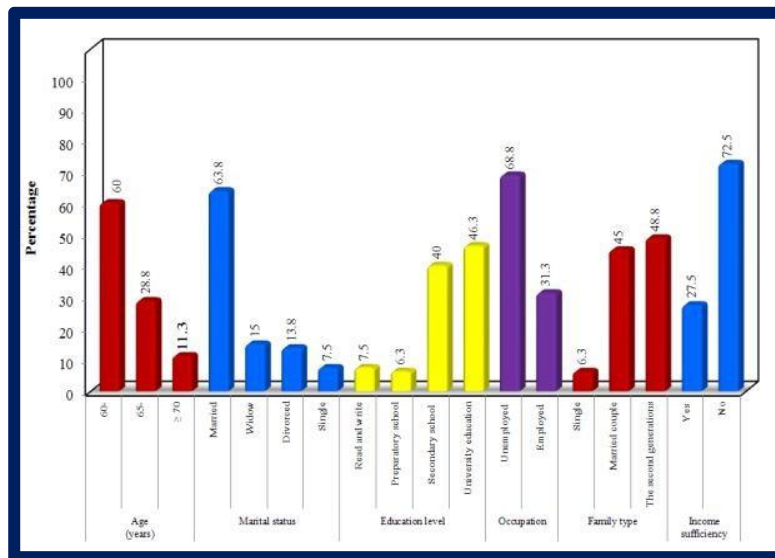


Figure 1. Distribution of the studied female older adults according to their socio-demographic data

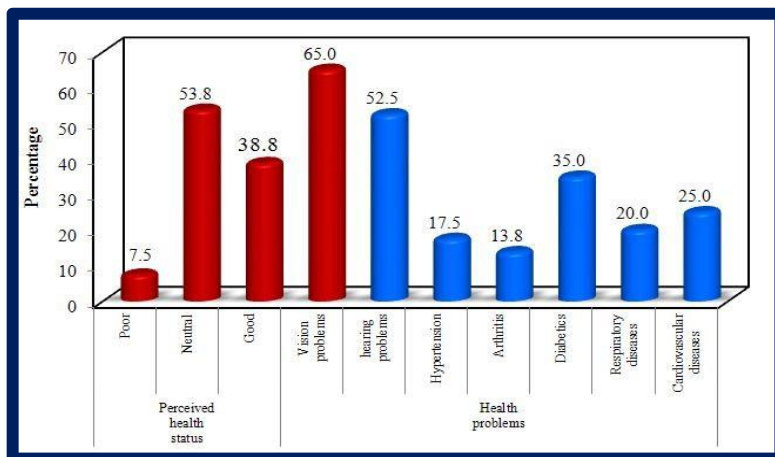


Figure 2. Distribution of the studied female older adults according to their perceived health status and health problems (*More than one answer.)

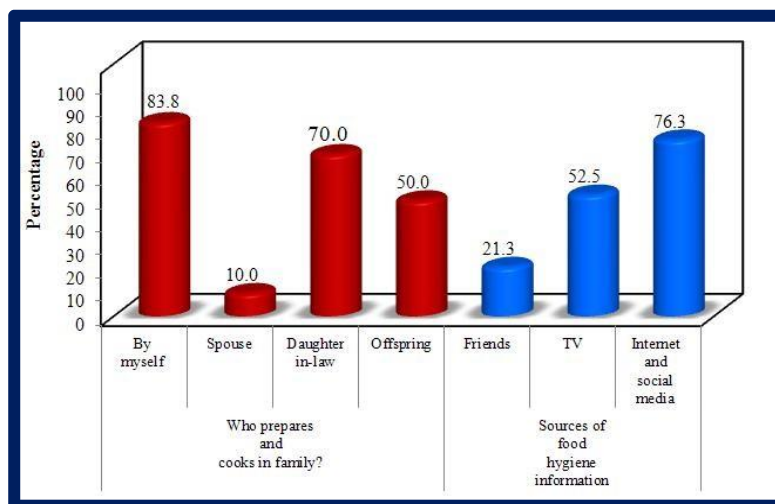


Figure 3. Distribution of the studied female older adults according to their sources of food hygiene information (*More than one answer.)**Table (1): Distribution of the studied female older adults according to their mean scores of food hygiene related knowledge subscales (n = 80)**

Items	Pre	Post	Follow up	Fr.	p
	Mean ± SD.	Mean ± SD.	Mean ± SD.		
Cross Contamination Prevention/Disinfection Procedures	3.34 ± 4.02	13.88 ± 4.57	12.25 ± 4.07	89.108*	<0.001*
Sig. bet. periods	p ₁ <0.001*, p ₂ <0.001*, p ₃ =0.018*				
Safe Times/Temperatures for Cooking/Storing Food	4.51 ± 3.45	8.14 ± 3.36	6.99 ± 2.80	37.652*	<0.001*
Sig. bet. periods	p ₁ <0.001*, p ₂ =0.003*, p ₃ =0.004*				
Foods that Increase Risk of Foodborne Disease	2.28 ± 5.00	17.54 ± 5.53	16.84 ± 4.29	114.525*	<0.001*
Sig. bet. periods	p ₁ <0.001*, p ₂ <0.001*, p ₃ =0.133				
Groups at Greatest Risk for Foodborne Disease	1.06 ± 1.36	3.23 ± 2.45	5.21 ± 1.66	86.558*	<0.001*
Sig. bet. periods	p ₁ <0.001*, p ₂ <0.001*, p ₃ =0.001*				
Total means subscales	11.19 ± 12.07	42.78 ± 13.27	41.29 ± 10.77	93.830*	<0.001*
Sig. bet. periods	p ₁ <0.001*, p ₂ <0.001*, p ₃ =0.082				

Fr: Friedman test, **Sig. bet. periods** was done using **Post Hoc Test (Dunn's)**, p₁: p value for comparing between **pre** and **post**, p₂: p value for comparing between **pre** and **Follow up**, p₃: p value for comparing between **post** and **Follow up**, *: Statistically significant at p ≤ 0.05

Table (2): The total knowledge scoring of the studied female older adults on levels of food hygiene (n = 80)

Items	Preprogram		Post program		Follow up		Test of Significance
	No.	%	No.	%	No.	%	
Cross Contamination Prevention/Disinfection Procedures							
Poor	80	100.0	1	1.3	5	6.3	Fr = 83.361* p <0.001*
Fair	0	0.0	13	16.3	27	33.8	
Good	0	0.0	66	82.5	48	60.0	
Safe Times/Temperatures for Cooking/Storing Food							
Poor	80	100.0	20	25.0	10	12.5	Fr = 20.814* p <0.001*
Fair	0	0.0	38	27.5	39	48.8	
Good	0	0.0	38	47.5	31	38.8	
Foods that Increase Risk of Foodborne Disease							
Poor	80	100.0	7	8.8	9	11.3	Fr = 108.916* p <0.001*
Fair	0	0.0	25	31.3	23	28.8	
Good	0	0.0	48	60.0	48	60.0	
Groups at Greatest Risk for Foodborne Disease							
Poor	80	100.0	0	0.0	0	0.0	Fr = 85.583* p <0.001*
Fair	0	0.0	11	13.8	34	42.5	
Good	0	0.0	69	86.3	46	57.5	
Total Knowledge level subscales							
Poor	80	100.0	7	8.8	9	11.3	Fr = 106.246* p <0.001*
Fair	0	0.0	10	12.5	17	21.3	
Good	0	0.0	63	78.8	54	67.5	

Fr: Friedman test

*: Statistically significant at p ≤ 0.05

Table (3): Distribution of the studied female older adults related to their mean scores food hygiene locus of control (n = 80)

Items	Pre program						Post program						Follow up						Fr.	p
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6		
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%		
Internal locus of control																				
Mean ± SD.	7.98 ± 3.24						14.75 ± 4.55						14.21 ± 4.99						57.740*	<0.001*
External locus of control																				
Mean ± SD.	12.72 ± 12.72						19.49 ± 5.15						18.98 ± 5.54						69.713*	<0.001*
Chance locus of control																				
Mean ± SD.	12.93 ± 4.75						23.10 ± 7.86						23.04 ± 7.82						67.415*	<0.001*
Total Mean ± SD.	33.62 ± 10.56						57.34 ± 17.25						56.22 ± 18.18						68.758*	<0.001*

* Significant at $p \leq 0.05$ 1= strongly disagree 2 = disagree 3 = slightly disagree 4 = slightly agree 5 = agree 6 = strongly agree

Table (4): Distribution of the studied female older adults according to their mean scores food hygiene related self-efficacy (n = 80).

Items	Pre					Post					Follow up					Fr.	p
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5		
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%		
Total Mean ± SD.	50.69 ± 21.92					97.13 ± 30.81					96.76 ± 24.92					92.872*	<0.001*

* Significant at $p \leq 0.05$, 1 = I am sure I could not do it, 2 = I could not do it, 3 = I don't know if I could do it, 4 = I could do it, 5 = I am sure I could do it

Table (5): Distribution of the studied female older adults according to their mean scores of food hygiene related practices (n = 80)

Items	Pre	Post	Follow up	Fr.	p
	Mean ± SD.	Mean ± SD.	Mean ± SD.		
Food Purchasing	1.29 ± 1.41	5.46 ± 3.42	4.93 ± 3.40	38.700*	<0.001*
Sig. bet. periods	p ₁ <0.001*, p ₂ =0.001*, p ₃ =0.024*				
Food storage	4.41 ± 2.60	11.70 ± 4.03	11.10 ± 3.75	122.791*	<0.001*
Sig. bet. periods	p ₁ <0.001*, p ₂ <0.001*, p ₃ =0.011*				
Personal Hygiene	2.70 ± 1.32	4.80 ± 1.43	4.46 ± 1.20	69.235*	<0.001*
Sig. bet. periods	p ₁ <0.001*, p ₂ <0.001*, p ₃ =0.063				
food preparation	1.24 ± 1.66	5.85 ± 1.79	5.50 ± 1.76	126.464*	<0.001*
Sig. bet. periods	p ₁ <0.001*, p ₂ <0.001*, p ₃ =0.206				
Food cooking	1.18 ± 1.41	4.96 ± 1.43	4.65 ± 1.45	123.943*	<0.001*
Sig. bet. periods	p ₁ <0.001*, p ₂ <0.001*, p ₃ =0.192				
Food reheating	0.78 ± 0.80	2.48 ± 0.81	2.44 ± 0.84	109.036*	<0.001*
Sig. bet. periods	p ₁ <0.001*, p ₂ <0.001*, p ₃ =0.843				
Food cooling	0.46 ± 0.73	1.66 ± 0.48	1.34 ± 0.48	83.551*	<0.001*
Sig. bet. periods	p ₁ <0.001*, p ₂ <0.001*, p ₃ =0.027*				
Total means	12.05 ± 8.46	36.91 ± 11.84	34.41 ± 10.81	126.465*	<0.001*
Sig. bet. periods	p ₁ <0.001*, p ₂ <0.001*, p ₃ <0.001*				

Fr: Friedman test, Sig. bet. periods was done using Post Hoc Test (Dunn's), p₁: p value for comparing between pre and post, p₂: p value for comparing between pre and Follow up, p₃: p value for comparing between post and Follow up

*: Statistically significant at p ≤ 0.05

Table (6): The total practices scoring of the studied female older adults on levels of food hygiene (n = 80)

Items	Preprogram		Post program		Follow up		Test of Significance	
	No.	%	No.	%	No.	%	Fr.	p
Food Purchasing								
Poor	78	97.5	27	33.8	28	35.0	89.035*	<0.001*
Fair	2	2.5	5	6.3	5	6.3		
Good	0	0.0	48	60.0	47	58.8		
Food storage								
Poor	74	92.5	24	30.0	32	40.0	79.436*	<0.001*
Fair	4	5.0	16	20.0	16	20.0		
Good	2	2.5	40	50.0	32	40.0		
Personal Hygiene								
Poor	51	63.8	28	35.0	27	33.8	44.693*	<0.001*
Fair	27	33.8	6	7.5	9	11.3		
Good	2	2.5	46	57.5	44	55.0		
Food preparation								
Poor	74	92.5	22	27.5	24	30.0	86.492*	<0.001*
Fair	0	0.0	2	2.5	8	10.0		
Good	6	7.5	56	70.0	48	60.0		
Food cooking								
Poor	74	92.5	21	26.3	22	27.5	92.214*	<0.001*
Fair	4	5.0	4	5.0	18	22.5		
Good	2	2.5	55	68.8	40	50.0		
Food reheating								
Poor	74	92.5	16	20.0	18	22.5	92.223*	<0.001*
Fair	0	0.0	10	12.5	9	11.3		
Good	6	7.5	54	67.5	53	66.3		
Food cooling								
Poor	69	86.3	27	33.8	52	65.0	47.821*	<0.001*
Fair	0	0.0	0	0.0	0	0.0		
Good	11	13.8	53	66.3	28	35.0		
Total practices level score								
Poor	74	92.5	24	30.0	22	27.5	89.812*	<0.001*
Fair	4	5.0	8	10.0	17	21.3		
Good	2	2.5	48	60.0	41	51.3		

Fr: Friedman test

*: Statistically significant at p ≤ 0.05

Table (7): Multivariate analysis binary logistic regression for socio-demographic factors affecting knowledge, self-efficacy, locus of control and practice (n = 80)

Older adults' Characteristics	Knowledge				Self-efficacy				Locus Of control				Practice			
	p	OR	95% CI		p	OR	95% CI		p	OR	95% CI		p	OR	95% CI	
			LL	UL			LL	UL			LL	UL			LL	UL
Age																
60- [®]																
65- ≥ 70	0.047* 0.019*	12.105 12.757	1.031 1.528	142.136 106.471	0.002* 0.004*	50.369 55.691	4.272 3.505	593.864 884.990	0.888 0.424	1.144 2.169	0.175 0.324	7.463 14.504	0.118 0.144	4.293 4.239	0.689 0.611	26.742 29.397
Marital status																
Married [®]																
Widow	0.761	1.532	0.098	23.984	0.434	3.161	0.177	56.525	0.284	3.005	0.401	22.536	0.322	0.352	0.045	2.778
Divorced	0.282	0.172	0.007	4.242	0.388	0.260	0.012	5.552	0.372	0.298	0.021	4.244	0.035*	23.185	1.252	429.230
Single	0.858	0.666	0.008	56.795	0.010*	0.001	0.000	0.200	0.728	1.766	0.072	43.591	0.590	2.470	0.092	66.027
Education level																
Read and write	0.913	1.151	0.094	14.137	0.917	1.160	0.071	18.943	0.630	1.846	0.152	22.376	0.184	8.459	0.362	197.795
Preparatory school	0.036*	32.783	1.260	853.103	0.085	16.033	0.679	378.537	0.380	3.477	0.215	56.226	0.037*	34.122	1.230	946.319
Secondary school	0.607	1.905	0.164	22.196	0.845	1.215	0.174	8.499	0.167	3.531	0.590	21.128	0.152	3.190	0.653	15.592
University education [®]																
Occupation																
Unemployed	0.077	16.265	0.736	359.543	0.292	0.317	0.037	2.693	0.571	2.044	0.172	24.243	0.491	0.448	0.045	4.412
Employed [®]																
Family type																
Single [®]																
Married couple	0.867	0.710	0.013	38.602	0.022*	56.855	1.779	1817.165	0.049*	0.045	0.002	0.983	0.425	0.293	0.014	5.980
The second generations	0.206	0.072	0.001	4.270	0.220	8.158	0.285	233.708	0.017*	0.010	0.000	0.438	0.729	1.705	0.083	35.093
Income sufficiency																
Yes [®]																
No	0.690	0.589	0.044	7.930	0.278	3.647	0.352	37.757	0.533	1.826	0.275	12.113	0.544	1.797	0.271	11.911
Perceived health status																
Poor	0.738	1.746	0.067	45.819	0.350	6.110	0.137	271.592	0.030*	23.403	1.363	401.928	0.209	6.410	0.354	115.940
Neutral	0.166	4.148	0.554	31.075	0.746	0.744	0.124	4.470	0.367	1.985	0.448	8.804	0.766	1.270	0.262	6.155
Good [®]																

OR: Odds ratio CI: Confidence interval LL: Lower limit UL: Upper Limit *: Statistically significant at p ≤ 0.05 ® Reference group

Discussion

Older adults are more likely to get sick from harmful bacteria in food and susceptible to acquire foodborne illness due to weakened immune function, this makes it harder to combat bacteria, parasites, and other pathogens. Else, very low amounts of available stomach acid make these individuals more susceptible to gastrointestinal and diarrheal infections. As well, reduced taste and smell acuity, the medications they are taking, chronic diseases they are suffering from, and unsafety food hygienic behaviors at home are all attributable to the risks for foodborne illness. Furthermore the likelihood of mortality from foodborne pathogens is reported to be increased among older adults than the general population. Older adults' inadequate knowledge and negative behavior toward food hygiene may increase implementation of unsafe food practices. This shed the light that food hygiene practices represented in store, handle, prepare food is an urgent need for older adults to avoid food poisoning (**Sseguya et al., 2018; CDC, 2019; Evans & Redmond, 2019**).

The current study finding reveals that the age of female older adults ranged from 60 to more than 70 years with a mean of 64.61 ± 3.87 , the majority of them had university and secondary educational level. Moreover, more than two thirds of the female older adults were unemployed after retirement and less than three quarter of them had insufficient income this that may attributes to puts the older adults at risk for foodborne illness). Income mark the amount of food that an individual can afford to buy unexpired and non-soiled. Income also determines whether low- income individuals can afford to dispose of adulterated foods in their home when necessary without having to make the hard choice of eating it anyway. As well as, the chances of food contamination and cross contamination may become higher especially in the low socio-economic status due to unsatisfactory environmental

conditions, poor personal hygiene, unhygienic preparation, storage and feeding of foods. So, Lack of adequate food hygiene may lead to food borne illness and death of the older adults. Similar findings were reported by **Sseguya et al. (2018)** and **Evans and Redmond (2018)**.

Additionally, the current study found that more than half of the studied female older adults had neutral perceived health status. It may be explained that they had a high impact on their life satisfaction and may be benefit from education for safe food handling and food hygienic practices and, in turn, prevent some of the annual foodborne illnesses. These results are consistent with those of similar previous studies (**Young et al., 2017b; Taillie, 2018**) otherwise, the current study finding reveals that around two thirds of the studied female older adults had vision and hearing problem, and more than one quarter of them had reported a diabetic's diseases and cardiovascular diseases. This finding may be attributed to age related changes and weakened immune systems such as diminished capacity or physical impairment, taking multiple medicines for chronic diseases, this make them more susceptible to foodborne illness. These results provide both insights into the food hygiene knowledge and practices for older adults to protect them from food borne diseases. These findings were supported by the results of **Fernandes et al. (2018)** and **Vilar-Compte et al. (2017)**.

Moreover, the present study revealed that more than three quarters of the female older adults prepares and cooks the food by their own. This may be due to; they took the major responsibility for food preparation and storage at home and their food handling is fundamental in nature. Similar findings were reported by **Johannesson et al. (2016)**.

Several studies had approved that the educational programs provide opportunity for the older adults to generate a better understanding, raise their knowledge and

awareness about food hygiene and foodborne illness. This knowledge can play a positive role in decreasing food-borne illness and can possibly be a useful approach in keeping of safe food preparation practices which can help to change their behaviors (**Evans & Redmond, 2016; McWilliams et al., 2017; Evans & Redmond, 2018**).

The same picture was portrayed in the current study that cumulative findings show, although more than three quarters of the female older adults had information about food hygiene mainly through internet and social media, the majority of them had poor food hygiene related knowledge before health teaching program implementation. While, they achieved a highly statistically significant difference after application of the program and in the follow up phase after one month. These findings could be attributed to the effect of health education program on the female older adults, focuses on cross contamination preventing and disinfection procedures, safe times, temperatures for cooking and storing food, foods that increase risk of foodborne illness and groups at greatest risk for foodborne disease. These results are consistent with those of similar previous studies (**EKOS Research Associates, 2010; Rodrigues et al., 2017 & Young et al., 2017b**) who reported that more knowledge an older adults possessed, the more positive, for changing their behavior towards food hygiene and practices.

There is ample evidence that Locus of control is an important aspect of personality, it plays an important role in health behaviors, which refers to how strongly older adult believe they have taken control over the situations as changing their behavior to safe food handling and experiences of safe food hygiene practices that affect their lives. Locus of control relates to the actual control beliefs about outcomes and appears to be more constant across changing

behaviors and situations (**Weimer et al., 2017**).

The result of the present study confirmed the effectiveness of the health teaching program on the studied female older adults' own control regarding the internal locus of control, food hygiene external locus of control and their beliefs concerning chance locus of control that revealed a significant difference in the preprogram, post program and follow up. The current findings drawn that the majority of them take responsibility for their lives and actions, they are more empowered, helpful, and carefully work to bring about positive change for protecting themselves from food poisoning and had a personal responsibility for positive food hygienic practice. This may be attributed to the improvement of female older adults' knowledge about safe food hygienic handling and practices. This knowledge could shape their perspectives and beliefs toward safe food hygienic handling, practices and to reduce the risks for food borne illness. Also, they may be more interested by knowledge gain from the researcher that provide a booklet during implementation of the program which make the female older adult track their achievements in best way. These findings are consistent with the results of (**Lee et al., 2017; Adlakha & Chawla, 2018**) who found a high locus of control among their study sample is associated with the performance of a wide array of food hygienic health protective behaviors.

Food hygiene related self-efficacy could be accounted for female older adults' sense of control or belief in their own ability to change a behavior. The confidence in their own ability, or self-efficacy, influence their success in changing their Food hygiene behavior. So, older adults' self- confidence played a major role when they converted intentions into action. On the plus side, the health teaching program accounted for increases in the related mechanisms of self-efficacy and locus of control through positive food hygiene

beliefs and positive feelings of self-efficacy. This can be explained by gaining control over food hygiene handling and practices (Pourhoseinzadeh et al., 2017; Adlakha & Chawla, 2018).

This could explain the results of the current study where the food hygiene related self-efficacy of the female older adults, during preprogram phase, was particularly low. This may be due to low confidence in their ability to perform a correct food hygiene health behavior or withdraw from an unhealthy food hygiene behavior. Along with so, after implementation of the program and after one month follow, the present result showed high self-efficacy among the female older adults with the difference is statistically significant between them. This may reflect the significant effect of health teaching program on the female older adults' confidence regarding food hygiene self-efficacy. Similar findings were reported by (Ng et al., 2015; Young et al., 2017a; Young et al., 2017b; Shamsalinia et al., 2019; Thaivalappil et al., 2019) who found that high self-efficacy among their participant and increased in their ability to successfully adopt the recommended health behaviors to prevent the health threat after food hygiene program that designed to increase knowledge about food hygiene, and emphasize on the importance of adopting safe food handling practices.

In this context, the current study findings reveal that the vast majority of the studied female older adults had poor food hygiene related practices include personal hygiene, food purchasing, storage, preparation, cooking, reheating and cooling before program implementation, which contributed to lack of knowledge, failure to implement known food hygiene practices due to cultural habit, may believe that food handling behaviors they practiced were not causing them to become ill, or may not be aware that they are more vulnerable to foodborne illness. However, the picture was completely different after

implementation of the program and in the follow up phase, that less than two third of them had achieved a good food practices with a statistically significant difference. The current result reflects significant effect of health teaching program, feeling of high self-efficacy and locus of control among the studied female older adults play an important role in enhancing the adoption of adequate food hygienic practices for attainment to these finding. They translate their high knowledge about good food handling practice. In the same line the findings of (Moreira et al., 2018; Evans & Redmond, 2019; Yap et al., 2019).

Lastly, the multivariate analysis logistic regression in the current study revealed a significant association between socio-demographic factors and the studied female older adults' food hygiene knowledge, locus of control, self-efficacy and practice as dependent variable. It presents that the age range from 65 to more than 70 years and the level of preparatory education were the most socio- demographic factors make the female older adults more fold with poor knowledge, low self-efficacy and poor practice related to food hygiene. These may be attributed to their aging process, low personal responsibility for protecting themselves from food poisoning, while they carefully work to bring about positive change for protecting themselves from food poisoning after implementation of the health teaching program. Moreover, The logistic regression analysis reveals that the married couple and second generations' family were good protective locus of control behaviors this may reflect to if the female older adults is a close relative or spouse, they are more likely to support the individual in making healthier decisions for food hygiene handling and practice. Else, the pressure from a son, daughter, or spouse creates stronger intent to engage in a positive behavior. These results are consistent with those of similar previous studies (Young et al., 2017a; Adlakha & Chawla, 2018).

Conclusion

Based on the results of the current study, it can be concluded that the food hygiene locus of control, self-efficacy related to knowledge and practice of all the studied female older adults improved and achieved a highly statistically significant differences after the implementation of the food hygiene teaching program and in the follow up phase than before it. Additionally, the study findings focus attention on a significant association between socio-demographic factors and food hygiene knowledge, locus of control, self-efficacy and practice as dependent variable among the studied female older adults.

Recommendations

The findings of the current study spotlight on the following recommendations

- Continuing education efforts, attendance for different health education classes and updating of knowledge for older adults about food hygiene to change their behaviors related to certain cultures and belief that may be responsible for negative attitude towards it.
- Raising the knowledge about the importance of practicing food hygiene that should be committed from early education by including it into the national curriculum.
- Food hygiene program and training to improve knowledge and practices for food handlers, ensure that all the food they sell is safe, an acceptable health standard is maintained and food hygiene risks are minimized.

References

Adlakha, M., & Chawla, G. (2018). A Study on Determinants of Health Promoting Behaviors in Older Adults. *International Journal of Health Sciences & Research*, 8(7), 292-297.

Al-Sakkaf, A. (2015). Domestic food preparation practices: a review of the reasons for poor home hygiene practices. *Health promotion international*, 30(3), 427-437. <https://doi.org/10.1093/heapro/dat051>.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191-215.

Brocklehurst, J. C., Fillit, H. M., Rockwood, K., Young, J., & Abdelhafiz, A. H. (2017). *Brocklehurst's textbook of geriatric medicine and gerontology* (8th ed.). Elsevier.

Brown, K. M. (1999). *Health locus of control*. University of South Florida.

Byrd-Bredbenner, C., Maurer, J., Wheatley, V., Schaffner, D., Bruhn, C., & Blalock, L. (2007a). Food safety self-reported behaviors and cognitions of young adults: results of a national study. *Journal of food protection*, 70(8), 1917-1926. <https://doi.org/10.4315/0362-028x-70.8.1917>.

Byrd-Bredbenner, C., Wheatley, V., Schaffner, D., Bruhn, C., Blalock, L., & Maurer, J. (2007b). Development and Implementation of a Food Safety Knowledge Instrument. *Journal of Food Science Education*, 6(3), 46-55. <https://doi.org/https://doi.org/10.1111/j.1541-4329.2007.00029.x>.

Byrd-Bredbenner, C., Wheatley, V., Schaffner, D., Bruhn, C., Blalock, L., & Maurer, J. (2007c). Development of Food Safety Psychosocial Questionnaires for Young Adults. *Journal of Food Science Education*, 6(2), 30-37. <https://doi.org/https://doi.org/10.1111/j.1541-4329.2007.00021.x>.

Centers for Disease Control and Prevention [CDC]. (2019). *People With a Higher Risk of Food Poisoning*. CDC.

Central Statistical Processing Center. (2017). *Egypt demographics and statistics*.

Choi, J.-H., Yoo, H.-E., Chung, H., Lee, H.-S., Lee, M.-J., Chang, H.-J., Lee, K.-E., Yi, N., & Kwak, T.-K. (2018). Evaluation of Effectiveness of Food Safety Education Program Based on Social Cognitive Theory for Elderly in the Middle Class. *Journal of the Korean Society of Food Science and Nutrition*, 47, 838-846. <https://doi.org/10.3746/jkfn.2018.47.8.838>.

EKOS Research Associates. (2010). *Survey of Canadians' Knowledge & Behaviour Related to Food Safety*. EKOS research associates inc.

Emirates News Agency. (2017). *Food Handling Training Enhances the Safety of the Work*

- Environment at Abu Dhabi Food Facilities*. <http://wam.ae/ar/details/1395302620903>. [Accessed in: Dec, 2018]
- Evans, E. W., & Redmond, E. C. (2016). Older Adult Consumer Knowledge, Attitudes, and Self-Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis. *Journal of food protection*, 79(2), 263-272. <https://doi.org/10.4315/0362-028x.jfp-15-312>.
- Evans, E. W., & Redmond, E. C. (2018). Behavioral Observation and Microbiological Analysis of Older Adult Consumers' Cross-Contamination Practices in a Model Domestic Kitchen. *Journal of food protection*, 81(4), 569-581. <https://doi.org/10.4315/0362-028x.jfp-17-378>.
- Evans, E. W., & Redmond, E. C. (2019). Domestic Kitchen Microbiological Contamination and Self-Reported Food Hygiene Practices of Older Adult Consumers. *Journal of food protection*, 82(8), 1326-1335. <https://doi.org/10.4315/0362-028x.jfp-18-533>.
- Fernandes, S. G., Rodrigues, A. M., Nunes, C., Santos, O., Gregório, M. J., de Sousa, R. D., Dias, S., & Canhão, H. (2018). Food Insecurity in Older Adults: Results From the Epidemiology of Chronic Diseases Cohort Study 3. *Frontiers in medicine*, 5, 203. <https://doi.org/10.3389/fmed.2018.00203>.
- Grembowski D, Patrick D, Diehr P, Durham M, Beresford S, Kay E, Hecht J. Self-Efficacy and Health Behavior Among Older Adults. *Journal of Health and Social Behavior*.2014 May; 34(2), 89-104.
- Havelaar, A. H., Kirk, M. D., Torgerson, P. R., Gibb, H. J., Hald, T., Lake, R. J., Praet, N., Bellinger, D. C., de Silva, N. R., Gargouri, N., Speybroeck, N., Cawthorne, A., Mathers, C., Stein, C., Angulo, F. J., & Devleeschauwer, B. (2015). World Health Organization Global Estimates and Regional Comparisons of the Burden of Foodborne Disease in 2010. *PLoS medicine*, 12(12), e1001923. <https://doi.org/10.1371/journal.pmed.1001923>.
- Johannesson, J., Rothenberg, E., Dahlin-Ivanoff, S., & Slinde, F. (2016). Gender differences in practice, knowledge and attitudes regarding food habits and meal patterns among community dwelling older adults. *The journal of aging research & clinical practice*, 4, 220-228. <https://doi.org/10.14283/jarcp.2016.117>.
- Kendall, H., Kuznesof, S., Seal, C., Dobson, S., & Brennan, M. (2013). Domestic food safety and the older consumer: A segmentation analysis. *Food quality and preference*, 28(1), 396-406. <https://doi.org/10.1016/j.foodqual.2012.11.006>.
- Lee, H., Chang, C., Cheng, Z., & Chen, Y. (2017). Will an Organic Label Always Increase Food Consumption? It Depends on Food Type and Consumer Differences in Health Locus of Control. *Food Quality and Preference*, 63, 88-96. <https://doi.org/10.1016/j.foodqual.2017.08.002>.
- McWilliams, R., Hallman, W., Cuite, C., Senger-Mersich, A., Sastri, N., Netterville, L., & Byrd-Bredbenner, C. (2017). Food Safety Practices of Homebound Seniors Receiving Home-Delivered Meals. *Topics in Clinical Nutrition*, 32, 268-281. <https://doi.org/10.1097/TIN.0000000000000117>.
- Moreira, A. C. A., Silva, M. J. D., Darder, J. J. T., Coutinho, J. F. V., Vasconcelos, M. I. O., & Marques, M. B. (2018). Effectiveness of an educational intervention on knowledge-attitude-practice of older adults' caregivers. *Revista brasileira de enfermagem*, 71(3), 1055-1062. <https://doi.org/10.1590/0034-7167-2017-0100>.
- Murray, R., Glass-Kaastra, S., Gardhouse, C., Marshall, B., Ciampa, N., Franklin, K., Hurst, M., Thomas, M. K., & Nesbitt, A. (2017). Canadian Consumer Food Safety Practices and Knowledge: Foodbook Study. *Journal of food protection*, 80(10), 1711-1718. <https://doi.org/10.4315/0362-028x.jfp-17-108>.
- National Health Insurance Service. (2015). *Symposium about elderly medical expenses 2016*. National Health Insurance Service.
- Ng, M., Babra, G., Haydu, L., & Martin, D. (2015). *Influencing Food Safety Behaviour*

- in the Home A Rapid Review*. Health Protection Division.
- Pourhoseinzadeh, M. M., Gheibizadeh, M. P., & Moradikalboland, M. (2017). The Relationship between Health Locus of Control and Health Behaviors in Emergency Medicine Personnel. *International journal of community based nursing and midwifery*, 5(4), 397-407.
- Rodrigues, A. M., Gregório, M. J., Gein, P., Eusébio, M., Santos, M. J., de Sousa, R. D., Coelho, P. S., Mendes, J. M., Graça, P., Oliveira, P., Branco, J. C., & Canhão, H. (2017). Home-Based Intervention Program to Reduce Food Insecurity in Elderly Populations Using a TV App: Study Protocol of the Randomized Controlled Trial Saúde.Come Senior. *JMIR research protocols*, 6(3), e40. <https://doi.org/10.2196/resprot.6626>.
- Roy, A., Francis, S., Shaw, A., & Rajagopal, L. (2016). Promoting Food Safety Awareness for Older Adults by Using Online Education Modules. *Journal of Extension*, 54, 1TOT8.
- Shamsalinia, A., Ghadimi, R., Chaffjiri, R. T., Norouzzinejad, F., Pourhabib, A., & Ghaffari, F. (2019). Nutrition self-efficacy assessment: designing and psychometric evaluation in a community-dwelling elderly population. *Journal of Health, Population and Nutrition*, 38(1), 38. <https://doi.org/10.1186/s41043-019-0203-3>.
- SHJMMUN. *Sharjah Food Safety Program*. <https://portal.shjmmun.gov.ae/en/pages/sfsp.a.spx>. [Accessed in: Dec, 2018]
- Sseguya, H., Mazur, R., & Flora, C. (2018). Social capital dimensions in household food security interventions: implications for rural Uganda. *Agriculture and Human Values*, 35, 117-129. <https://doi.org/10.1007/s10460-017-9805-9>.
- Taillie, L. S. (2018). Who's cooking? Trends in US home food preparation by gender, education, and race/ethnicity from 2003 to 2016. *Nutrition journal*, 17(1), 41. <https://doi.org/10.1186/s12937-018-0347-9>.
- Thaivalappil, A., Papadopoulos, A., & Young, I. (2019). Intentions to adopt safe food storage practices in older adults: An application of the theory of planned behaviour. *British Food Journal*, 122(1), 181-197. <https://doi.org/10.1108/BFJ-07-2019-0483>.
- Vilar-Compte, M., Gaitán-Rossi, P., & Pérez-Escamilla, R. (2017). Food insecurity measurement among older adults: Implications for policy and food security governance. *Global Food Security*, 14, 87-95. <https://doi.org/10.1016/j.gfs.2017.05.003>.
- Weimer, K., Richard, A., Lisspers, J., & Lipsanen, J. (2017). Values, attitudes, moral judgment competence, locus of control and sense of coherence as determinants of pro-environmental behaviors and behavioral intentions. *Journal of Multidisciplinary Engineering Science and Technology*, 4(5), 2568-2583.
- World Health Organization [WHO]. (2015a). *Food safety*. WHO.
- World Health Organization [WHO]. (2015b). *World Health Day 2015: food safety. improving food safety, from farm to plate*. WHO.
- World Health Organization [WHO]. (2015c). *World Report on Ageing and Health*. WHO.
- Wright, M., Canham, R., & Masrani, R. (2011). *Food safety behaviours in the home: Final Report for the Food Standards Agency CL2351 R4 V6* FCA. Greenstreet Berman Ltd.
- Yap, L., Francis, S. L., Shelley, M. C., Lillehoj, C., Montgomery, D., & Winham, D. M. (2016). Risky Food Handling Practices among Community-Residing Older Adults. *The FASEB Journal*, 30, 674.
- Yap, L., Francis, S. L., Shelley, M. C., & Montgomery, D. (2019). Gaps in Safe Food Handling Practices of Older Adults. *Journal of Extension*, 71(3), 1-12.
- Young, I., Reimer, D., Greig, J., Meldrum, R., Turgeon, P., & Waddell, L. (2017a). Explaining Consumer Safe Food Handling Through Behavior-Change Theories: A Systematic Review. *Foodborne pathogens and disease*, 14(11), 609-622. <https://doi.org/10.1089/fpd.2017.2288>.
- Young, I., Reimer, D., Greig, J., Turgeon, P., Meldrum, R., & Waddell, L. (2017b). Psychosocial and health-status determinants of safe food handling among consumers: A systematic review and meta-analysis. *Food Control*, 78, 401-411. <https://doi.org/10.1016/j.foodcont.2017.03.013>.