Impact of Nutritional Educational Program on the Nutritional Habits and Status among Older Adults at Qena City, Egypt

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Abstract: Background: The age-related changes of the gastrointestinal tract, availability of the food and the functional ability affect the nutritional intake among elderly people. Most of the diseases originate from malnutrition especially among the vulnerable group as older adults. Therefore, the aim of this study is to improve older adults' nutritional habits. The study followed a quesi experimental research design and was carried out in the Elderly Club at Qena City. Sample; One hundred and six older adults who fulfilled the inclusion criteria participated in this study and assigned randomly into fifty-three intervention group and fifty-three control group. Two tools were used to collect the data; Tool I Structured Interview Form and tool II Mini-Nutritional Assessment Scale. The results of this study revealed that there are no statistically significant differences of frequency of usual food consumed per week between pre-test and Posttest among the intervention or control group (P > 0.05). There are significance differences between pre-test and Posttest of food preparation method and the substances used in cooking among only the intervention group. It was concluded from the current study that the intervention improved the nutritional habits. Based on the study results, it will be useful implement the nutritional educational program at all older organizations which provide services to older adults such as elderly homes, elderly clubs, and hospitals in Egypt.

1. Introduction

The elderly population is predicted to quadruple over the next 25 years in developing countries. It will represent over 25% of the total population **(WHO, 2015)**. By 2030 about 75% of elderly will be in less developed countries. In that countries, the elderly is poor and in poor health. **(Boraschi et al., 2010)**.

According to State Information Service, Egypt is rapidly aging in its demographic structure. The total percent of older adults aged 60 years and above has increased to be 6.9 in 2016 from 6 percent in 2010 **(State Information Service, 2016).** According to WHO, the life expectancy in Egypt also increased to be 69 years for male and 73 years for female **(World Health Organization, 2015b)**.

More increasing lifespan, more increasing risk of multiple chronic diseases progression especially those related to malnutrition. As people get older, there are many age-related factors that influence their health, including decreased appetite, limited food intake, altered gut absorption of nutrients, and use of multiple medications that may lead to chronic disorders. Therefore, older adults present a unique set of nutrition challenges, as they may be deficient in some essential nutrients including protein, vitamins, and minerals, although they are not aware of these deficiencies. Nutrition education therefore is critical to support health, reduce the risk and delay the onset of chronic diseases in this population **(Harding et al., 2016)**.

Nutritional deficiencies in this population confirmed by many studies done in Egypt and concluded that the protein intake was inadequate and the micronutrient intake was found to be lower than the recommended dietary allowance among elderly people who have poor nutritional status ***(El-damhougy et al., 2010; Esmayel et al., 2013; Ibrahim et al., 2013; Aspinall & Lang, 2018)**.

Many studies focused on how to use and select a specific food or nutrients. Researches have demonstrated that increasing fruit and vegetable consumption promotes healthy aging by delaying the

onset or severity of a variety of chronic conditions ***(Nicklett & & Kadell, 2013; Pallauf & Rimbach, 2013; Upadhyay & Madhulika, 2015)**. The 2015–2020 dietary guidelines for Americans recommends that adults over the age of 51 consume between 1.5–2.0 cups of fruits and 2.5–3.0 cups of vegetables each day. The guidelines place an emphasis on consuming a variety of fruits and vegetables **(U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015)**.

Based on all previous mentioned studies, identifying, selecting and consuming proper valuable sources of food is so important. Nutritional education program is an attractive, non-invasive means of enhancing and optimizing important physiological functions especially among elderly people**.** As reported by the previous research, it is possible to improve the dietary intake of community dwelling elders to include more fruits, vegetables, and calcium-rich foods by nutrition education intervention **(Fernández-Barrés et al., 2017)**.

Successful nutrition education program has common characteristics. These include: nutrition messages limited to one or two; simple and practical messages targeted to specific needs (i.e., how to choose high-fiber foods); reinforcement and personalization of messages; hands-on activities; goal setting and self-assessment, incentives and access to health professionals **(Thomas et al., 2010)**.

If nutritional educational program is instituted in an effective and timely manner, a substantial reduction in health care expenditures may result. Changes in diet behaviors (reducing carbohydrate and fat intake) were positively associated with a belief that consuming a healthful diet would contribute to better health **(Lahmann et al., 2016)**.

As educator, facilitator and consultant adviser on educational programme using different learning methods, the gerontological nurse specialist is working actively with older people to promote person-centered care and knowledge. She / he works collaboratively across boundaries to bring resources together and fill identified gaps (unhealthy habits) in knowledge and habits to meet the needs of older people and promotes health **(Ford, 2013)**.

The ultimate goal of nutrition research and public health is to transfer acquired knowledge to populations so persons can make educated choices about their diets and lifestyles to achieve and maintain good health throughout life. Targeting nutrition education to older adults is necessary to prevent or delay the spiral toward ill health and disability **(Cummins & Kunkel, 2015; Findsen, 2016)**.

Many researches in Egypt assessed the older adults' nutritional status, habits, and knowledge found that elderly nutritional intake is unsatisfactory and lower than recommended dietary allowance related to lack of knowledge ***(Al Riyami et al., 2010; El-damhougy et al., 2010; Ibrahim et al., 2013)** and many studies recommend that education intervention is the most important key to prevent disease, increase immunity and promote health **(Queen, 2015).** So, this study concerns to increase older adults' knowledge about the nutritional habits of older adults by designing the health education program, implementing this program and evaluate its effects. This work will be done under the umbrella of health promotion and health education.

2. Subjects and Method
A)   **Research design:** Quasi experimental.
B)   **Aim of the study:**
To improve older adults' nutritional habits.
Specific objectives:
    1. Assess older adults' nutritional habits.
    2. Design health education program about nutrition.
    3. Implement health education program about nutrition.
    4. Evaluate health education program about nutrition.
C)   **Research hypothesis**
Older adults' nutritional habits will be improved.
D)   **Setting:**
The study was conducted in the elderly club at Qena city, Egypt.
E)   **Sample size:**
•   *Sample selection technique*
Total coverage of all older adult members of the elderly club at Qena city by using Mini-Mental State Examination (MMSE) scale and ask for willing to participate. A convenient sample of 106 older adults who fulfilled the inclusion criteria from total hundred fifty (150) members of the elderly club was randomly assigned equally into two groups 53 as intervention group and 53 as control group).
•   *Inclusion criteria*
The study included all elderly members at Qena Elderly club from both sexes according to the following inclusion criteria:
    1. Aged 60 years and older.
    2. Free from any mental diseases according to their score of MMSE scale (he/she must obtain 24-30 score).
F)   **Tools of the study:**
Two tools were used to collect the data which are structured interview form and Mini-Nutritional Assessment Short Form (MNA-SF)
Tool I: Structured interview form:
This tool was developed by the researchers based on relevant literature. It consists of three parts.
Part one: Socio-demographic data:

This part contains a set of questions concerning socio-demographic data as age, sex, marital status, income, residence and level of education.

Part two: Knowledge of older adults regarding nutrition.

This part includes a set of questions concerning macronutrients and micronutrients such as the best sources of carbohydrate for elderly. There are open questions which finally categorized as (incorrect answer = 0, incomplete and correct answer = 1and complete and correct answer = 2) and multiple choice questions (scores according to the number of the correct answers).

Part three: Dietary intake:

This part to assess nutritional habits by using 24 hours recall method. In this part, the subjects mention all usual food taken in the last day (the day before filling the question), the preparation method, the frequency of consuming food per week, and the substances used in cooking.

Tool II: Mini–Nutritional Assessment Scale Short Form (MNA-SF).

The most recent version of the MNA-SF was developed in 2011 **(Kaiser M. et al., 2011)** and consists of 6 questions on food intake, weight loss, mobility, psychological stress or acute disease, presence of dementia or depression, and body mass index which is calculated by the weight (in kilograms) by the height squared (in meters). Scores of MNA-SF were categorized as the following:

- Normal nutritional status = 12-14
- Indicate at risk of malnutrition = 8-11
- Indicates malnutrition = 0-7

The study phases (method)

I.   Administrative phase:

The study was approved by the college of Nursing, Assuit University, Egypt. At the same time, permission to carry out the study from the director of the elderly club after explanation the purpose of the study was obtained. A verbal consent from elders to participate in the study was obtained after explanation of the study purpose.

A pilot study was done on ten percent of older adults who fulfilled the inclusion criteria to assess the tools for their applicability, clarity, and necessary modifications were done accordingly. The validity of tool I was tested for content by five nursing and medical experts in the related fields. The reliability of tool I was measured by Cronbach's Alpha and it was reliable 0.90. The validity and reliability of tool II (MNA-SF) scale were assessed previously by Kaiser et al (2011) **(Kaiser M. et al., 2011)**. This tool was translated into Arabic by the researchers.

II.   Data Collection phase (Field work)

The researchers used the MMSE as first step to assess the cognitive status of each members of elderly club to exclude member who get less than 24 score. Mini-Mental State Examination scale was developed by Folstein et al, 1975 and consists of 11 simple questions or tasks grouped into 5 cognitive domains **(Folstein M. & Folstein S., 1975)**which are orientation, registration of three words, attention & calculation, recall of three words and language. The validity and reliability of this scale were assessed previously by Abd-Elaziz (2014) **(Abd-Elaziz S., 2014)**. A possible score of 30 is used to provide a picture of an individual's present cognitive performance based on direct observation of test items/tasks completion. A score which less than 24 is the generally an accepted cutoff indicating the presence of cognitive impairment. Levels of impairment have been classified as the following:

- o No impairment: score = 24-30
- o Mild impairment: score = 18-23
- o Severe impairment: score = 0-17

The data were collected by the previously mentioned tools as a baseline (pre-test) from first to mid of May 2015. The subjects were divided into two groups. Male group (29) and female group (24). The educational program was developed and implemented in five weeks from 15 May to 22 June 2015.

The Health Education Program

The educational program was developed and implemented by the researchers based on older adult's knowledge regarding the nutrition and relevant literature review. Booklet, brochures, and posters were used to clarify the information.

The program phases

A.   Assessment phase:

The data were collected by the previously mentioned tools as a baseline to assess the subjects ' nutritional habits (pre-test).

B.   Planning phase:

The sessions and time of the program were decided during this stage. The study subjects were divided into male group (29) and female group (24) and 2 days for each group per week were determined.

C.   Implementation phase:

The educational program was implemented in five weeks from 15 May to 22 June 2015. The total number of participants are 53 but 3 of them dropped out after the second session so, 50 participants took and completed all sessions. The total number of sessions are 10; one session per day and two sessions per week for each group. Each session continued about 1.30 hours. The total sessions time is 15 hours for each group. The research motivated the subjects by measuring blood pressure and blood glucose level every time for each elderly. Before commencement of the sessions, the researchers introduced herself to the study subjects and oriented them about program purpose, importance, place, and sessions time.

D.   Evaluation phase:

Three months after program completion at the end of June 2015, the researchers did **late post-test** by using the previously mentioned tools.

Ethical consideration

‐ Verbal consent was obtained from every elderly person included in the study.

‐ Each elderly person was assured about the confidentiality of the collected data.

‐ The privacy of each elderly patient was maintained.

‐ No risk from sessions or the study tools.

Statistical analysis

Data were collected on paper documents, uploaded to Microsoft Excel for storage, and transferred to STATA, version 12, for analysis. Nominal variables, such as gender, marital status, and educational level, were described using frequency counts. Also, nutritional habits were described using frequency (n) and percentage (%). Fisher exact test was used to test associations between nominal variables and considered significant at $p \leq 0.05$.

3. Results

Part I: Sociodemographic characteristics of the study subjects.

Part II: Nutritional habits of the study subjects.

Part III: Association between nutritional habits and sociodemographic characteristics of the study subjects.

Part IV: Nutritional status of the study subjects.

Part I: Sociodemographic characteristics of the study subjects

Table (1) shows the sociodemographic characteristics of the intervention and the control group. All subjects in both groups were categorized into two categories: aged from sixty to sixty-four and from sixty-five to above. While the demographics of the two groups are not identical, there are no significant association observed (p > 0.05) except for monthly income (p = 0.012).

Table (1) Sociodemographic characteristics of the study subjects.

Sociodemographic characteristics	Intervention Group (n= 50)		Control Group (n= 53)		X^2	P-value *
	No.	%	No.	%		
Age:						
From 60 to 64	27	54.0	23	43.4		
From 65 and above	23	46.0	30	56.6	1.1581	0.282
Sex:						
Male	28	56.0	23	43.4		
Female	22	44.0	30	56.6	1.6350	0.201
Marital status:						
Married	40	80.0	37	69.8		
Widowed	10	20.0	16	30.2	1.4153	0.234
Educational level:						
Illiterate	15	30.0	19	35.9		
Less than secondary (includes Able to read & write, and primary level).	10	20.0	19	35.9		
Secondary and high	25	50.0	15	28.3	5.6811	0.058
Occupation before retirement:						
House wife	17	34.0	24	45.3		
Office work (employee)	25	50.0	23	43.4		
Manual work (skilled, farmer)	8	16.0	6	11.3	1.4780	0.478
Monthly income as their order:						
Adequate	27	54.0	41	77.4		
Inadequate	23	46.0	12	22.6	6.2574	0.012*
Residence:						
Rural	29	58.0	22	41.5		
Urban	21	42.0	31	58.5	2.7989	0.094

* P value be significant at ≤ 0.05

Part II: **Nutritional habits of the study subjects.**

Table (2) shows the frequency of usual food types consumed per week within the study subjects. Concerning the intervention group. There are no statistically significant differences of frequency of usual food consumed per week between pre-test and Posttest test (P > 0.05). It is observed that the number of subjects who consumed whole bread raised from

zero percent to one hundred percent (23 participant from 50 consumed whole bread) while the number of subjects who consumed white bread dropped off from one hundred percent to 74.0 %. Regarding the control group. There are no statistically significant differences of frequency of usual food consumed per week between pre-rest and Posttest test within control group (P > 0.05).

Table (2) Frequency of usual food types consuming per week of the study subjects.

Food types	Test	Frequency per week											
		Intervention group n = 50						Control group n = 53					
		Once or Twice		3 times		Daily		P-value *	Once or twice		3 times		Daily		P-value *
		No.	%	No.	%	No.	%		No.	%	No.	%	No.	%	
Meat (beef)	Pre	48	96.0	2	4.0	0	0.0	1.000	36	81.8	8	18.2	0	0.0	1.000
	Posttest	48	96.0	2	4.0	0	0.0		35	79.5	9	20.5	0	0.0	
poultry	Pre	50	100.0	0	0.0	0	0.0	....	53	100.0	0	0.0	0	0.0	....
	Posttest	50	100.0	0	0.0	0	0.0		53	100.0	0	0.0	0	0.0	
Fishes	Pre	50	100.0	0	0.0	0	0.0	....	53	100.0	0	0.0	0	0.0	....
	Posttest	50	100.0	0	0.0	0	0.0		53	100.0	0	0.0	0	0.0	
Legumes & beans #	Pre	12	24.5	1	2.0	36	73.5	1.000	6	11.3	0	0.0	47	88.7	0.597
	Posttest	12	24.5	1	2.0	36	73.5		7	13.2	0	0.0	46	86.8	
Eggs #	Pre	30	76.9	5	12.8	4	10.3	1.000	29	72.5	5	12.5	6	15.0	1.000
	Posttest	30	76.9	5	12.8	4	10.3		28	71.8	5	12.8	6	15.4	
Milk & milks products #	Pre	2	4.2	11	22.9	35	72.9	1.000	1	2.0	16	32.0	33	66.0	0.764
	Posttest	2	4.2	11	22.9	35	72.9		3	6.0	15	30.0	32	64.0	
Vegetable (cooked & raw)	Pre	2	4.0	24	48.0	24	48.0	1.000	8	15.1	12	22.6	33	62.3	1.000
	Posttest	2	4.0	24	48.0	24	48.0		8	15.1	11	20.7	34	64.2	
Fruits	Pre	27	54.0	4	8.0	19	38.0	0.915	17	32.1	11	20.7	25	47.2	1.000
	Posttest	25	50.0	5	10.0	20	40.0		17	32.1	12	22.6	24	45.3	
White bread	Pre	0	0.0	0	0.0	50	100.0	------	1	1.9	0	0.0	52	98.1	-------
	Posttest	13	26.0	0	0.0	37	74.0		3	5.7	0	0.0	50	94.3	
Whole bread #	Pre	0	0.0	0	0.0	0	0.0	------	0	0.0	0	0.0	8	15.1	-------
	Posttest	0	0.0	0	0.0	23	100.0		0	0.0	0	0.0	9	17.0	
Rice, pasta, Potato, sweet potato, taro	Pre	5	10.0	20	40.0	25	50.0	1.000	3	5.7	23	43.4	27	50.9	0.834
	Posttest	5	10.0	20	40.0	25	50.0		5	9.4	22	41.5	26	49.1	
Jam, honey, molasses #	Pre	1	33.3	2	66.7	0	0.0	0.400	2	15.4	9	69.2	2	15.4	1.000
	Posttest	3	100.0	0	0.0	0	0.0		2	15.4	9	69.2	2	15.4	

Significant at ≤ 0.05 as reported from fisher exact test

Table (3) illustrates the comparison of usual food preparation methods (boiling or frying) between pre-test and follow up-test within intervention and control group. It is interesting to notice that most of intervention subjects at pre-test had fried their food such as red meat, fatty meat, non-fatty poultry, and fatty poultry (66.7%, 78.3%, 70.0%, 75.0 respectively) while at Posttest more than two thirds of them had

boiled or grilled the same food (76.3%, 68.4%, 68.0%, 68.8% respectively) with highly statistical significance (P-value = 0.001, 0.004, 0.001, 0.001 respectively). Also, only one of intervention subjects at pre-test had boiled his/her cooked vegetable and the number increase to nineteen at Posttest with highly statistical significance (P = 0.001). Compared to control group,

there is no statistical significance between preparation method at pre-test and Posttest P-value > 0.05.

Table (4) reflects the frequency of food as it is within the study subjects. There was no change with the number of intervention subjects who consumed specific type of food as it is except for those who consumed white bread and whole bread. The number of white bread consumers dropped off from one hundred percent to 74.0 % while the number of whole bread consumers raised from zero percent to 46.0 percent (23 participant from 50 consumed whole bread). Compared to control group, there is no observed change with number of consumers.

Table (5) explicates the comparison of substance used for usual food preparation between pre-test and Posttest test in intervention and control group. The number of the intervention subjects who used vegetable oil for cooking red meat, fatty meat, non-fatty poultry, fatty poultry, cooked vegetable, and rice or pasta increased at Posttest test with statistical significance (P-value = 0.001, 0,003, 0.001, 0.001, 0.010, 0.001 respectively). Compared to control group, there is no statistical significance between substance used for cooking at pre-test and Posttest (P > 0.05).

Table (3) Comparison of usual food preparation method between pre-test and follow up-test in the study subjects.

Food	Preparation method	Intervention group					Control group				
		Pre		Posttest		p-value*	Pre		Posttest		p-value*
		No. #	(%)	No. #	(%)		No. #	(%)	No. #	(%)	
Red meat	Boiled/grilled	11	33.3	29	76.3	0.001*	7	18.9	12	31.6	0.289
	Fried	22	66.7	9	23.7		30	81.1	26	68.4	
Fatty meat	Boiled/grilled	5	21.7	13	68.4	0.004*	4	19.1	5	25	0.719
	Fried	18	78.3	6	31.6		17	81	15	75	
Canned meat	Boiled/grilled	0	0.0	3	30	0.070	1	20	2	40	1.000
	Fried	7	100	3	50		4	80	3	60	
Non-fatty poultry (Chicken, rabbit)	Boiled/grilled	15	30	34	68.0	0.001*	10	18.9	15	28.3	0.360
	Fried	35	70.0	16	32.0		43	81.1	38	71.7	
Fatty poultry (Duck, pigeon)	Boiled/grilled	8	25	22	68.8	0.001*	5	19.2	7	28	0.523
	Fried	24	75.0	10	31.3		21	80.8	18	72	
Fresh fishes	Boiled/grilled	0	0.0	20	40	0.001*	1	1.9	7	13.5	0.060
	Fried	50	100	30	60		52	98.1	45	86.5	
Frozen fishes	Boiled/grilled	0	0.0	1	25	0.444	0	0.0	2	28.6	0.462
	Fried	5	100	3	75		7	100	5	71.4	
Eggs	Boiled/grilled	21	53.9	23	59	0.820	20	50	21	53.9	0.823
	Fried	18	46.2	16	41		20	50	18	64.2	
Legumes & beans	Boiled or grilled	49	100	49	100	-------	53	100	53	100	--------
	Fried	0	0.0	0	0.0		0	0.0	0	0.0	
Cooked Vegetable	Boiled or grilled	1	2	19	38	0.001*	1	1.9	2	3.8	1.000
	Fried	49	98	31	62		52	98.1	51	96.2	
Rice / pasta	Boiled or grilled	0	0.0	7	14.3	0.012*	1	1.9	2	3.8	1.000
	Fried	49	100	42	85.7		52	98.1	51	96.2	
Potato, sweet potato, taro	Boiled or grilled	14	35.9	19	48.7	0.359	10	20	11	22	1.000
	Fried	25	64.1	20	51.3		40	80	39	78	

* Significant at ≤ 0.05 as reported from fisher exact test.
# The number of subjects who only consumed that food

Table (4) Frequency of food consumed as it is in the study subjects.

Food type	Frequency of food consumed as it is							
	Intervention Group (50)				Control Group (53)			
	Pre		posttest		Pre		posttest	
	No. *	(%)	No. *	(%)	No. *	(%)	No. *	(%)
Milk #	38	76.0	38	76.0	33	62.3	32	60.4
Yoghurt #	10	20.0	10	20.0	17	32.1	15	28.3
Cheese #	46	92.0	46	92.0	49	92.4	49	49
Raw vegetables #	42	84	42	84	48	90.6	48	48
Fruits	50	100.0	50	100.0	53	100.0	53	53
White bread	50	100.0	37	74.0	52	98.1	50	94.3
Whole bread #	0	0.0	23	46.0	8	15.1	9	17.0
Jam, honey, molasses #	3	6.0	3	6.0	13	24.5	13	24.5
Beverages	50	100.0	50	100.0	53	100.0	53	100.0

* The number of subjects who only consumed that food.

The number of subjects who only consumed that food

Table (5) Comparison of substance used for usual food preparation between pre-test and Posttest in intervention and control group.

Food	Substance used	Intervention group N (%)					Control group N (%)				
		Pre		posttest		p-value*	Pre		posttest		p-value*
		No. #	(%)	No. #	(%)		No. #	(%)	No. #	(%)	
Red meat	Vegetable Oil	1	3.0	17	46.0		11	29.7	15	39.5	
	Margarine	11	33.3	9	24.3	0.001*	11	29.7	10	26.3	0.677
	Butter (milk)	21	63.6	11	29.7		15	40.5	13	34.2	
Fatty meat	Vegetable Oil	4	17.4	12	63.7		2	9.5	4	20	
	Margarine	2	8.7	2	10.5	0.003*	4	19.1	4	20	0.662
	Butter (milk)	17	73.9	5	26.3		15	71.4	12	60	
Canned meat	Vegetable Oil	4	57.14	5	83.3		1	20	3	60	
	Margarine	0	0.0	0		0.559	0	0.0	0		0.524
	Butter (milk)	3	42.9	1	16.7		4	80	2	40	
Non-fatty poultry (Chicken, rabbit)	Vegetable Oil	4	8.2	23	46.0		12	22.6	16	30.2	
	Margarine	13	26.5	11	22	0.001*	11	20.8	10	18.9	0.704
	Butter (milk)	32	65.3	16	32		30	56.6	27	50.9	
Fatty poultry (Duck, pigeon)	Vegetable Oil	4	12.5	19	59.4		2	7.7	4	16	
	Margarine	7	21.9	5	15.6	0.001*	10	38.5	9	36	0.734
	Butter (milk)	21	65.6	8	25		14	53.9	12	48	
Fresh fishes	Vegetable Oil	50	100	49	100		52	100	52	100	
	Margarine	0	0.0	0	0.0	-------	0	0.0	0	0.0	-------
	Butter (milk)	0	0.0	0	0.0		0	0.0	0	0.0	
Frozen fishes	Vegetable Oil	5	100	4	100		7	100	7	100	
	Margarine	0	0.0	0	0.0	-------	0	0.0	0	0.0	-------
	Butter (milk)	0	0.0	0	0.0		0	0.0	0	0.0	
Eggs	Vegetable Oil	0	0.0	0			1	5	1	5.6	
	Margarine	5	25	5	31.3	0.722	1	5	1	5.6	1.000
	Butter (milk)	15	75	11	68		18	90	16	88.9	

The number of subjects who only consumed that food

Table (5) Comparison of substance used for usual food preparation between pre-test and Posttest in intervention and control group (cont.).

Food	Substance used	Intervention group N (%)					Control group N (%)				
		Pre		Follow up		p-value*	Pre		Posttest		p-value*
		No. #	(%)	No. #	(%)		No. #	(%)	No. #	(%)	
Legumes & beans	Vegetable Oil	18	36.7	23	46.9	0.521	26	49.1	29	54.7	0.900
	Margarine	9	18.4	9	18.4		3	5.7	3	5.7	
	Butter (milk)	22	44.9	17	34.7		24	45.3	21	39.6	
Cooked Vegetable	Vegetable Oil	6	12	19	38	0.010*	12	22.6	14	26.4	0.961
	Margarine	12	24	10	20		8	15.1	8	15.1	
	Butter (milk)	32	64	21	42		33	62.3	31	58.5	
Rice/pasta	Vegetable Oil	6	12.2	22	44.9	0.001*	13	24.5	15	28.3	0.962
	Margarine	14	28.6	12	24.5		8	15.1	8	15.1	
	Butter (milk)	29	59.2	15	30.6		32	60.4	30	56.6	
Potato, sweet potato, taro	Vegetable Oil	28	96.6	28	96.6	1.000	33	67.4	33	67.4	1.000
	Margarine	0	0.0	0	0.0		5	10.2	5	10.2	
	Butter (milk)	1	3.45	1	3.45		11	22.5	11	22.5	

* Significant at ≤ 0.05 as reported from fisher exact test.
#The number of subjects who only consumed that food

Part III: Association between nutritional habits and sociodemographic characteristics of the study subjects.

Table (6) represents association between income of the study subjects and their frequency consumption of usual food per week. Regarding the intervention group, there are a statistical significance differences between the frequency of legumes & beans, vegetable, and fruits by participants who have adequate income and inadequate income (P-value ≤ 0.05).

Table (6) Association between income of the study subjects and their frequency consumption of usual food per week.

Income	Test	Frequency of usual food per week													
		Intervention group						P-value *	Control group						P-value *
		Once or twice		3 times		Daily			Once or twice		3 times		Daily		
		No.	%	No.	%	No.	%		No.	%	No.	%	No.	%	
Meat (beef)															
Adequate	Pre	25	92.6	2	7.4	0	0.0	0.493	30	78.9	8	21.1	0	0.0	0.573
Inadequate		23	100.0	0	0.0	0	0.0		6	100.0	0	0.00	0	0.0	
Adequate	Follow up	25	92.6	2	7.4	0	0.0	0.493	29	76.3	9	23.7	0	0.0	0.319
Inadequate		23	100.0	0	0.0	0	0.0		6	100.0	0	0.00	0	0.0	
Fishes															
Adequate	Pre	27	100.0	0	0.0	0	0.0	....	40	100.0	0	0.0	0	0.0	......
Inadequate		23	100.0	0	0.0	0	0.0		9	100.0	0	0.0	0	0.0	
Adequate	Follow up	27	100.0	0	0.0	0	0.0	....	40	100.0	0	0.0	0	0.0	......
Inadequate		23	100.0	0	0.0	0	0.0		9	100.0	0	0.0	0	0.0	
Egg															
Adequate	Pre	13	68.4	2	10.5	4	21.1	0.126	20	64.5	5	16.1	6	19.4	0.170
Inadequate		17	85.0	3	15.0	0	0.0		9	100.0	0	0.0	0	0.0	
Adequate	Follow up	15	75.0	2	10.0	3	15.0	0.738	20	64.5	5	16.1	6	19.4	0.170
Inadequate		15	78.9	3	15.8	1	5.3		9	100.0	0	0.0	0	0.0	
Legumes & beans															
Adequate	Pre	12	46.2	1	3.8	13	50.0	0.001*	6	14.6	0	0.0	35	85.4	0.317
Inadequate		0	0.00	0	0.00	23	100.0		0	0.00	0	0.0	12	100.0	
Adequate	Follow up	12	46.1	0	0.00	14	53.9	0.001*	7	17.1	0	0.0	34	82.9	0.329
Inadequate		0	0.00	1	4.3	22	95.7		0	0.00	0	0.0	12	100.0	
Milk & milks products															
Adequate	Pre	0	0.0	3	11.5	23	88.5	0.018*	1	2.6	8	20.5	30	76.9	0.004*
Inadequate		2	9.1	8	36.4	12	54.5		0	0.0	8	72.7	3	27.3	
Adequate	Follow up	0	0.0	4	14.8	23	85.2	0.073	2	5.1	8	20.5	29	74.4	0.017*
Inadequate		2	9.5	7	33.3	12	57.1		1	9.1	7	63.6	3	27.3	
Vegetable															
Adequate	Pre	1	3.7	5	18.5	21	77.8	0.001*	4	9.8	10	24.4	27	65.8	0.138
Inadequate		1	4.4	3	82.6	19	13.0		4	33.3	2	16.7	6	50.0	
Adequate	Follow up	1	3.7	6	22.2	20	74.1	0.001*	4	9.8	9	21.9	28	68.3	0.190
Inadequate		1	4.3	18	78.3	4	17.4		4	33.3	2	16.7	6	50.0	
Fruits															
Adequate	Pre	6	22.2	2	7.4	19	70.4	0.001*	11	26.8	11	26.8	19	46.3	0.067
Inadequate		21	91.3	2	8.7	0	0.0		6	50.0	0	0.0	6	50.0	
Adequate	Follow up	5	18.5	3	11.1	19	70.4	0.001*	11	26.8	12	29.3	18	43.9	0.060
Inadequate		20	87.0	2	8.7	1	4.3		6	50.0	0	0.0	6	50.0	

Table (7) shows the association between residence of the study subjects and their frequency consumption of usual food per week. There are a statistical significance differences between the frequency of Legumes & beans, vegetable, and fruits among the intervention participants who live in rural and urban among the intervention group only (P-value ≤ 0.05).
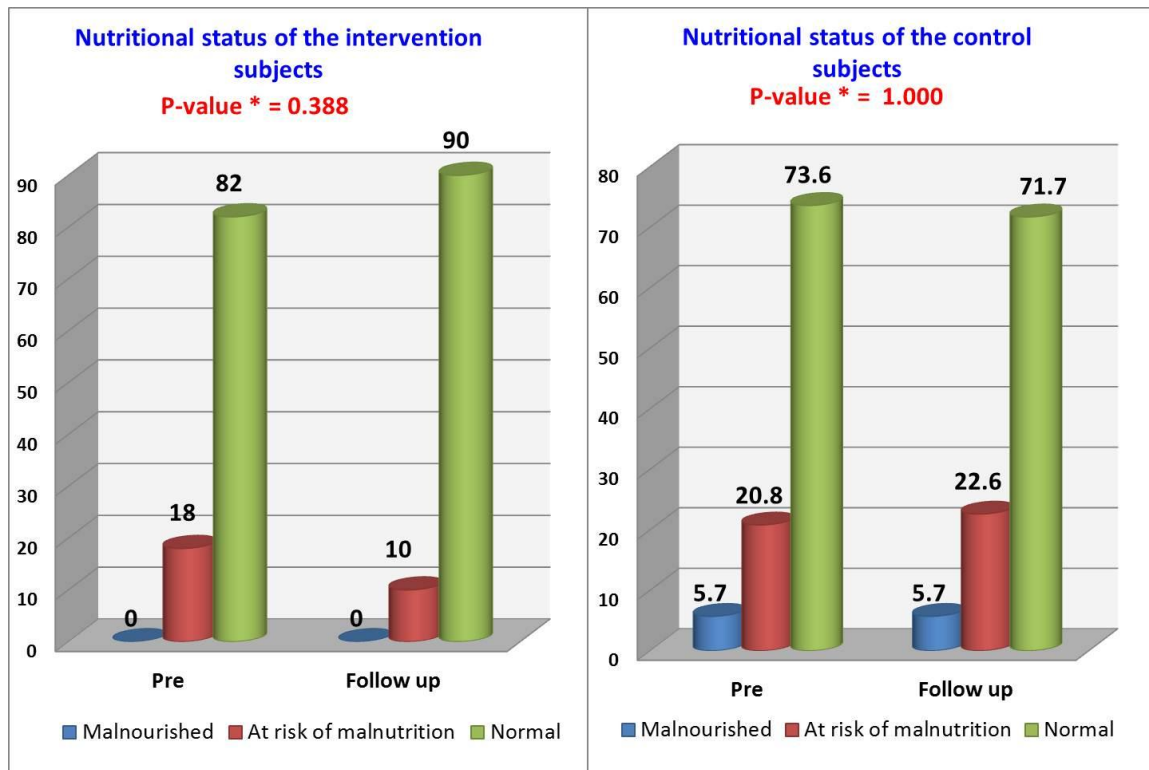
Part IV: Nutritional status of the study subjects.
Figure (1) shows nutritional status of the study subjects. It is noted that nutritional status of intervention and control subjects didn't change noticeably with no statistical differences within intervention and control group (P > 0.05).

Table (7) Association between residence of the study subjects and their frequency consumption of usual food per week.

Residence	Test	Frequency of usual food per week													
		Intervention group						P-value*	Control group						P-value*
		Once or twice		3 times		Daily			Once or twice		3 times		Daily		
		No.	%	No.	%	No.	%		No.	%	No.	%	No.	%	
Meat (beef)															
Rural	Pre	29	100.0	0	0.0	0	0.0	0.171	12	75.0	4	25.0	0	0.0	0.434
Urban		19	90.5	2	9.5	0	0.0		24	85.7	4	14.3	0	0.0	
Rural	Follow up	29	100.0	0	0.0	0	0.0	0.171	12	75.0	4	25.0	0	0.0	0.702
Urban		19	90.5	2	9.5	0	0.0		23	82.1	5	17.9	0	0.0	
Fishes															
Rural	Pre	29	100.0	0	0.0	0	0.0	....	22	100.0	0	0.0	0	0.0	....
Urban		21	100.0	0	0.0	0	0.0		27	100.0	0	0.0	0	0.0	
Rural	Follow up	29	100.0	0	0.0	0	0.0	....	22	100.0	0	0.0	0	0.0	....
Urban		21	100.0	0	0.0	0	0.0		27	100.0	0	0.0	0	0.0	
Egg															
Rural	Pre	19	82.6	4	17.4	0	0.0	0.026*	15	79.0	0	0.0	4	21.0	0.063
Urban		11	68.8	1	6.2	4	25.0		14	66.7	3	23.8	2	9.3	
Rural	Follow up	18	78.3	4	17.4	1	4.3	0.326	15	79.0	0	0.0	4	21.0	0.063
Urban		12	75.0	1	6.2	3	18.8		13	65.0	5	25.0	2	10.0	
Legumes & beans															
Rural	Pre	0	0.0	0	0.0	9	100.0	0.001*	4	18.2	0	0.0	18	81.8	0.219
Urban		12	60.0	1	5.0	7	35.0		2	6.5	29	93.5	0	0.0	
Rural	Follow up	0	0.0	1	3.5	28	96.0	0.001*	4	18.2	0	0.0	18	81.8	0.431
Urban		12	60.0	0	0.0	8	40.0		3	9.7	0	0.0	28	90.3	
Milk & milks products															
Rural	Pre	2	7.1	9	32.1	17	60.7	0.070	0	0.0	11	52.4	10	47.6	0.014*
Urban		0	0.0	2	10.0	18	90.0		1	3.4	5	17.2	23	79.3	
Rural	Follow up	2	7.4	9	33.3	16	59.3	0.027*	1	4.8	10	47.6	10	47.6	0.045*
Urban		0	0.0	2	9.5	19	90.5		2	6.9	5	17.2	22	75.9	
Vegetable															
Rural	Pre	2	6.9	22	75.9	5	17.2	0.001*	2	9.1	4	18.2	16	72.7	0.520
Urban		0	0.0	2	9.5	19	90.5		6	19.3	8	25.8	17	54.9	
Rural	Follow up	2	6.9	21	72.4	6	20.7	0.001*	2	9.1	4	18.2	16	72.7	0.563
Urban		0	0.0	3	14.3	18	85.7		6	19.3	7	22.6	18	58.1	
Fruits															
Rural	Pre	27	93.1	2	6.9	0	0.0	0.001*	6	27.3	2	9.1	14	63.6	0.087
Urban		0	0.0	2	9.5	19	90.5		11	35.5	9	29.0	11	35.5	
Rural	Follow up	24	82.8	3	10.3	2	6.9	0.001*	6	27.3	2	9.1	14	63.6	0.050*
Urban		1	4.8	2	9.5	18	85.7		11	35.5	10	32.3	10	32.3	

* Significant at ≤ 0.05 as reported from fisher exact test.

Nutritional status of the intervention subjects
P-value * = 0.388

Nutritional status of the control subjects
P-value * = 1.000

* Significant at ≤ 0.05 as reported from fisher exact test

Figure (1) Nutritional status of the study subjects.

4. Discussion

Nutrition plays a pivotal role in health promotion, diseases prevention, and chronic diseases management. ***(Abbas et al., 2012; Munkyong-Pae, 2012; Doan et al., 2013)**. While there are many studies in less developed Arab countries especially Egypt confirmed that nutritional habits are unhealthy among young and old people, there is currently lack of health educational program about nutrition and healthy nutritional habits. ***(Al Riyami et al., 2010; El-damhougy et al., 2010; Ibrahim et al., 2013).**

This study aimed to improve older adults' nutritional habits by design, implement and evaluate the health education program about the nutrition. Sociodemographic characteristics of the intervention and control group were quite similar.

The usual food types consumed in Egypt are beef, poultry, fishes, beans and legumes, available vegetables and fruits are obtained in Egypt each in its own growing season, some in winter, other in summer such as orange, watermelon, grape, pear, mango, capsicum, green beans, peas, tomato, spinach) bread (white, whole), rice, pasta, potatoes, jam, molasses, and beverages such as tea, fruits juice.

The frequency of previous food types per week in both intervention and control group didn't change significantly (P > 0.05). This current finding is not consistent with the findings from the study done in Korea by **(Kim et al., 2012)**, which shows that subjects' intake of energy, protein, fat, carbohydrate, calcium, phosphorus, iron, vitamin A, thiamin, riboflavin, niacin, and vitamin C all increased significantly (P < 0.001).

Also, the current findings are in a disagreement with two studies was done in USA; the first one by **(Hersey et al., 2015)**, in Michigan evaluated the impact of a four-session interactive nutrition education program called "Eat Smart, Live Strong on the consumption of fruit and vegetables by low-income older adults". The researchers founded that the program had a statistically significant impact on participants' average daily consumption of fruit and vegetables. The program increased participants' average daily consumption of fruit by 0.20 cups (P < 0.05), of vegetables by 0.31 cups (P < 0.01), and combined cups of fruit and vegetables by 0.52 cups (P < 0.01).

The second study was done by **(Brewer et al., 2016)**, who observed a significant increase in actual fruit and vegetable intake in the intervention group (p < 0.05). In addition, from pre- to post-intervention, a trend towards increased self-reported intake in the

variety of fruits and, vegetables, was observed among the intervention group. As well, a significant increase in the number of days intervention participants self-reported consuming at least 4.5 cups of fruits and vegetables in the last 7 days (2.44 ± 2.09 days to 4.28 ± 1.99 days (p =.004))**.**

Although, the clear observation of non-significance changes pertaining usual food frequency of consumption, the whole bread consumption increased from zero percent at pre-test to one hundred percent after the three months' follow-up. Many of intervention participants said to the researchers that although they are going far to get the whole bread daily, they want to maintain consuming this type of bread. Also, they consume more fresh food. The present findings are in an agreement with previous study done in America by (**Ellis et al., 2005**), to examine the effects of a nutrition education intervention entitled "Whole Grains and Your Health Program" on improving the intake and behaviors related to whole grain foods. Ellis et al found an increase in the total intake of whole grain bread, whole grain cereal, and whole wheat crackers ($P \leq 0.05$) after the intervention.

The limited availability of all kind of food, the low income, high prices, and the non-easy access transportations in Egypt may be the causes of non-change frequency of consumption among the intervention group. The current study represented a statistical significance differences between the frequency of legumes & beans, vegetable, and fruits by intervention participants who have adequate income and inadequate income (P-value ≤ 0.05). As well as a statistical significance differences between the frequency of the same food among the same group who live in rural and urban among the intervention group only (P-value ≤ 0.05). At the same line, (**Zenk et al., 2005**), in USA confirmed that the consumption of food such as fruits and vegetables affected by type and location of stores (availability) as well as the income level ($P < 0.05$).

The common preparation methods of usual food types in Egypt are boiling, grilling, frying, or as it is and the most used one is frying method. Within the intervention group, the preparation method has been highly significantly changed ($P \leq 0.001$) from frying to boiling or grilling most of food after telling the participants that the healthy method is boiling and / grilling the food while the unhealthy method is frying which provide body with unwanted fats and carcinogens. These observation are in agreement with statistically significant changes in specific dietary habits and positive cooking/eating behaviours before and after participation in nutrition education-based cooking workshops ($p < 0.05$) offered in Southern Quebec by *(**Flego et al., 2014**) and (**Moreau et al., 2015**) in Australia.

Not only boiling or frying are the challenge of consuming food in Egypt especially among older adults but the substance used such as margarine, butter (milk), and vegetables oil. These substances are more common and available to most people. At baseline data, the milk butter was used by most of intervention and control participants while at Posttest, most of the intervention participants tend to use vegetables oil instead in preparing most of their food such as red meat, fatty meat, non-fatty poultry, fatty poultry, cooked vegetable, and rice or pasta. This change indicates lack of knowledge and awareness among Egyptian older adults which is the main cause of unhealthy nutritional habits that change when they well known healthy and unhealthy behaviors. Similarly, *(**Hutchinson et al., 2016**), in UK observed that most participants learned healthier ways to cook including using less oil and fat, and discovering healthy alternatives for high-fat foods among elderly aged over 65 years after implementing Food cooking programme. In contrast, (**Wrieden, 2007**), in UK done the intervention named "Cook well". There were no significant differences (p-value > 0.05) reported between pre- and post- intervention.

May be lack of the knowledge results in poor nutritional habits. The baseline data of the current study reflects poor nutritional habits in terms of frequency of consumption, preparation methods, and substances used among intervention and control group. This may be related to poor dietary knowledge as confirmed by this study and other previous studies in Egypt and Arab countries which reported that elderly nutritional intake is unsatisfactory and lower than recommended dietary allowance (**El-damhougy et al., 2010**),(**Al Riyami et al., 2010**) & (**Ibrahim et al., 2013**).

According to this study results, nutrition educational intervention is effective for change the unhealthy nutritional habits to healthy habits especially for preparation methods, and the substances used. These results are in consistent with *(**Muchiri et al., 2016**), in South Africa who confirmed that nutrition education improved specific dietary behaviours and (**Kim et al., 2012**), in Korea who concluded that the total dietary behavior score of elderly increased after the education program ($P < 0.001$)**.**

The nutritional status of the participants was slightly improved with no statistical differences (p-value > 0.05). This result is in an agreement with the results of the study in Egypt by (**Hegazy et al., 2013**), and the other in Korea by *(**Kim et al., 2012**), who confirmed that the nutritional status of the participants were improved after the intervention. These results

confirm that there were improvements in nutritional habits and status after the nutrition education intervention.

Conclusion

Based on the results of the present study, it was concluded that the nursing intervention improved nutritional habits of the elderly. The usual food frequency didn't change noticeably except for the whole bread. Also, the frequency of usual food consumption influenced by adequate or inadequate income and the place of residence either rural or urban. Concerning the preparation method and the substance used in cooking, both were improved after the intervention within the study group.

Recommendations

Based on the results of the current study, the following recommendations are suggested to improve older adults' nutritional habits:

• The nutritional educational program should be implemented at all older organizations which provide services to older adults such as elderly homes, elderly clubs, and hospitals in Egypt.

• Increase public awareness through mass media as radio and TV, and newsletters to spread much information about proper nutrition among older adults.

• Periodical refreshment of the older adults' information by continues implementation of the program.

Further studies should be conduct including the different items of the older adults' lifestyle as exercise, stress management, sleep and rest.

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