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Impact of nutritional health educational program `on elderly persons' nutritional knowledge, attitude and practice.

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ABSTRACT

It is particularly important for aged people to adopt diet and lifestyle habits that minimize the risk of morbidity and maximize the prospects for healthy aging. The aim of this study was to improve elderly nutritional knowledge, attitude, and practice by conducting quasi-experimental intervention study through assessment of nutritional knowledge, practice and attitude of elderly people (n=115, +60 years) in Abu Khalifa village, Ismailia, Egypt, implementation of a nutritional health education program for them and evaluation of the effect of the program based on an interview questionnaire form. Our results showed that the total knowledge increased from a pre-intervention level of 26.1% to a post-level of 82.6% (p<0.001). Total positive attitude increased from a pre-intervention level of 28.7% to a post-level of 60.0% (p<0.001). The attitude was positively correlated with the health perception at the pre-phase, and negatively to the crowding index and the number of diseases at the post-phase. The statistically significant independent predictors of the knowledge scores were intervention and the level of education, income, and health perception, all being positive and of attitude score, income, number of chronic diseases, physical activity, and knowledge score, all being negative except for the knowledge score.

Keywords: Nutritional Health Educational Program, knowledge, attitude, practice, elderly.

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INTRODUCTION

According to the United Nations, "an advanced age society" is one where the percentage of the population over 65 is higher than 7% [1]. Economically less developed regions have been slower to adopt ageing as a major public concern, despite the fact that older populations in many developing countries are growing more rapidly than are those of industrialized nations [2]. Malnutrition among the aged is caused by a number of factors such as condition of the family, illiteracy, poverty, ignorance, superstition, lack of food, frequent infections etc. [3]. Diet and lifestyle over a whole life influence morbidity and mortality. Because of the cumulative effect of adverse factors, it is particularly important for aged people to adopt diet and lifestyle habits that minimize the risk of morbidity and maximize the prospects for healthy aging [4]. Food habits in aged people are not only influenced by the lifetime preferences and by physiological changes according to aging but also by social aspects such as loneliness, economic situations or conditions and disability. The quality of diet is often poor among people 85 years and older [5].

Nutrition counseling is important for bringing a permanent and favorable solution to the problem of malnutrition. It is an effective tool for changing the food habits of people without affecting their sentiments. It is a process by which knowledge, attitudes and beliefs about food and health are channelized into actual practices which are sound and consistent with the individual needs, purchasing power, food availability, health and socio-cultural background [6]. This signifies that nutrition counseling is needed to evaluate the effect on knowledge, attitudes and practices of the elderly. Since the elderly population is at a huge risk of major diseases, members of health care units should handle their education carefully. Through such education, benefits are provided regarding protective and wellness development for many elderly people [7]. In the era of population aging, understanding the dynamic needs along with social psychological dynamics of help-seeking behavior among elderly persons is fundamental to assessing the impact of food programs. Theory and knowledge to understand what, how and why nutritional needs are manifested within the context of food program delivery and to develop study designs are required to examine the impact of food programs and to make food programs a more effective and beneficial intervention for elderly persons [8]. The nutritional care of patients is one of the primary responsibilities of all healthcare workers. A poor nutritional status can lead to malnutrition, which can have serious consequences for an individual's quality of life [9]. As primary caregivers, primary healthcare physicians are ideally positioned to ascertain the elder's nutritional status and to ensure appropriate measures are taken to optimize nutritional intake for each individual. This research provides an overview of nutritional screening and explores elders' knowledge, attitudes and practices to nutrition as well as challenges and opportunities. For improving elderly nutritional knowledge, attitude and practice of nutritional health education program was implemented and evaluated.

SUBJECTS AND METHODS

A quasi-experimental intervention study design with pre-post assessment, conducted in Abu Khalifa village, Ismailia, Egypt was used in this study. The investigated sample consisted of 115 rural elderly 60 years old or more people, excluding those with severe chronic diseases or disabilities. An interview questionnaire form was used to collect the data pertaining to knowledge, attitudes, and dietary practices. It included socio demographic data , medical history including chronic diseases, smoking, physical activity and perception of health as well as knowledge questionnaire to assess elderly basic information about aging changes, disorders related to nutrition, food composition, healthy dietary habits, and design a balanced meal. Dietary practices were focused mainly on food frequency intake. Attitude scale was used to assess elderly attitude towards some food behaviors and misconceptions, etc. It contained positive and negative statements.. It was pilot-tested on 10 patients who were not included in the main study sample. The researchers performed the modifications needed accordingly. The pilot study also served to determine the time needed to complete the interview.A health education program about nutrition was designed and implemented by the researchers to improve elderly nutritional knowledge, attitude, and practice through counseling sessions. The program included aging changes and disorders related to nutrition, variety of food and increased fluid intake. The program effectiveness was assessed using the same data collection of the pre-test.

RESULTS

The socio-demographic characteristics of the elderly in the study sample indicated that their mean age was 66.2 years, with slight preponderance of women 53%. Slightly more than half of them were married

53.9% , while 38.3% were widows. About one fourth 26.1% were illiterate and 32.2% could just read and write. Only two of them1.7% were still working. As for economic status, slightly more than half of them had insufficient income 58.3% and a crowding index of two or more 51.3%. It was found that a great majority of the elderly had chronic diseases 90.4%. The most frequent were diabetes 67.8%, heart disease 56.6%, and hypertension 33.9%. Only one 0.9% mentioned having a psychiatric problem. About two-fifth 40.9% of the elderly were smokers. Smokers had a mean number of cigarettes 20.9, and a mean of 27 smoking years; 38.3% of them reported quit trials. Three-fourth of the elderly were living on second or higher floors 74.8%. All of them, except three 2.6%, reported sharing in home chores either sometimes or always. Similarly, all but two 1.7% helped in shopping. Overall, the majority 85.2% reported some kind of physical activity.

Table 1 demonstrates generally low percentages of satisfactory knowledge among the elderly before the intervention. The lowest percentage was regarding food composition 20.9%. After implementation of the intervention, their knowledge showed statistically significant improvements in all areas p<0.001. The highest percentage of satisfactory knowledge was regarding the disorders related to nutrition 87.8%.

Table 1: Pre-post intervention changes in elderly' knowledge about aging and nutrition

Satisfactory knowledge (50%+) of:	Time				X^2 Test	p-value
	Pre (n=115)		Post (n=115)			
	No.	%	No.	%		
Aging changes	40	34.8	86	74.8	37.14	<0.001*
Disorders related to nutrition	48	41.7	101	87.8	53.53	<0.001*
Food composition	24	20.9	88	76.5	71.28	<0.001*
Nutritional needs of elderly	51	44.3	86	74.8	22.11	<0.001*
Healthy dietary habits	38	33.0	76	66.1	25.11	<0.001*

(*) Statistically significant at p<0.05

Concerning attitudes, Table 2 indicates statistically significant improvements in almost all areas after implementation of the intervention. The percentages of agreement with positive statements and disagreement with negative statements demonstrated significant increases at the posttest. Only the items related to physical activity at home and to the tendency to reduce sugars in diet did not show statistically significant changes.

Table 2: Pre-post intervention changes in elderly' attitudes towards aging and nutrition

Attitudes	Time				X^2 Test	p-value
	Pre (n=115)		Post (n=115)			
	No.	%	No.	%		
I tend to eat balanced diet:						
Disagree	5	4.3	2	1.7		
Uncertain	40	34.8	20	17.4	11.20	0.004*
Agree	70	60.9	93	80.9		
I drink not only when thirsty:						
Disagree	47	40.9	65	56.5		
Uncertain	43	37.4	26	22.6	7.10	0.03*
Agree	25	21.7	24	20.9		
I like eating fruits/vegetables daily						
Disagree	40	34.8	5	4.3		
Uncertain	46	40.0	39	33.9	45.44	<0.001*
Agree	29	25.2	71	61.7		
I tend to free meat from fat:						
Disagree	21	18.3	29	25.2		
Uncertain	58	50.4	27	23.5	18.15	<0.001*
Agree	36	31.3	59	51.3		
I have no tendency to eat fatty diet:						
Disagree	38	33.0	19	16.5		
Uncertain	42	36.5	34	29.6	14.69	0.001*
Agree	35	30.4	62	53.9		

I am keen to drink milk daily:						
Disagree	64	55.7	32	27.8		
Uncertain	33	28.7	32	27.8	26.46	<0.001*
Agree	18	15.7	51	44.3		
I like to eat with my family:						
Disagree	45	39.1	18	15.7		
Uncertain	38	33.0	27	23.5	27.59	<0.001*
Agree	32	27.8	70	60.9		
I tend to reduce tea/coffee drinking:						
Disagree	22	19.1	58	50.4		
Uncertain	44	38.3	25	21.7	25.00	<0.001*
Agree	49	42.6	32	27.8		
Home activities are not enough to me:						
Disagree	48	41.7	46	40.0		
Uncertain	32	27.8	35	30.4	0.19	0.91
Agree	35	30.4	34	29.6		
I tend to reduce sugars in my diet:						
Disagree	46	40.0	45	39.1		
Uncertain	32	27.8	20	17.4	4.72	0.09
Agree	37	32.2	50	43.5		

(*) Statistically significant at p<0.05

Table 3 shows statistically significant associations between the knowledge of the elderly before the intervention and the marital status p=0.001, education p=0.001, and income p<0.001. It is evident that the percentages of satisfactory knowledge were higher among the married and those with sufficient income. It also showed an increasing trend with the higher level of education.

Table 3: Relation between pre- intervention elderly' knowledge about aging and nutrition and their socio-demographic characteristics

	Knowledge				X^2 Test	p-value
	Satisfactory		Unsatisfactory			
	No.	%	No.	%		
Age (years):						
<70	23	25.6	67	74.4		
70+	7	28.0	18	72.0	0.06	0.81
Gender:						
Male	16	29.6	38	70.4		
Female	14	23.0	47	77.0	0.66	0.42
Marital status:						
Married	24	38.7	38	61.3		
Unmarried	6	11.3	47	88.7	11.12	0.001*
Education:						
Illiterate/read write	9	13.4	58	86.6		
Basic/Intermediate	14	41.2	20	58.8	13.73	0.001*
High School	7	50.0	7	50.0		
Job status:						
Not working	30	26.5	83	73.5		
Working	0	0.0	2	100.0	Fisher	1.00
Income:						
Insufficient	4	6.0	63	94.0		
Sufficient	26	54.2	22	45.8	33.69	<0.001*
Crowding index:						
<2	19	33.9	37	66.1		
2+	11	18.6	48	81.4	3.48	0.06

(*) Statistically significant at p<0.05

Concerning the relation between pre-intervention knowledge and medical history and dietary habits, Table 4 points to statistically significant relations with chronic diseases p=0.007 and their numbers p<0.001, self perception of health p=0.01, the intake according to Recommended Daily Allowance RDA of cereals p=0.001, proteins p=0.008, dairy products p<0.001, and intake of balanced diet p<0.001. It is noticed that the

percentages of satisfactory knowledge were higher among the elderly with no chronic diseases, fair/good health, with proper intake of proteins, dairy, and balanced diet. However, those with intake of cereals less than the recommended daily allowance had more satisfactory knowledge compared to those with proper intake. Table 5 indicates statistically significant associations between the knowledge of the elderly after the intervention and their income p<0.001, and crowding index p=0.005. It is noticed that the percentages of satisfactory knowledge were higher among the elderly with sufficient income and those with lower crowding index. Regarding the relation between post-intervention knowledge and medical history and dietary habits, Table 6 demonstrates statistically significant relations with the intake according to RDA of cereals p<0.001, proteins p=0.02, and dairy products p=0.02. It is evident that the percentages of satisfactory knowledge were higher among the elderly with proper intake of proteins and dairy, but conversely among those with intake of cereals less than the recommended daily allowance.

Table 4: Relation between pre- intervention elderly' knowledge about aging and nutrition and their medical history, smoking, and nutritional habits

	Knowledge				X^2 Test	p-value
	Satisfactory		Unsatisfactory			
	No.	%	No.	%		
Chronic diseases:						
No	7	63.6	4	36.4		
Yes	23	22.1	81	77.9	Fisher	0.007*
Total No. of diseases:						
Mean±SD	1.2±0.9		2.2±0.9		U=24.15	<0.001*
Smoking:						
No	22	32.4	46	67.6		
Yes	8	17.0	39	83.0	3.39	0.07
Physically active:						
No	8	47.1	9	52.9		
Yes	22	22.4	76	77.6	Fisher	0.07
Self-perception of health:						
Poor	0	0.0	16	100.0		
Fair/good	30	30.3	69	69.7	Fisher	0.01*
Cereals:						
<RDA	29	33.7	57	66.3		
RDA	1	3.4	28	96.6	10.31	0.001*
Vegetables/fruits:						
<RDA	30	26.5	83	73.5		
RDA	0	0.0	2	100.0	Fisher	1.00
Proteins:						
<RDA	18	20.2	71	79.8		
RDA	12	46.2	14	53.8	7.02	0.008*
Dairy products:						
<RDA	22	21.0	83	79.0		
RDA	8	80.0	2	20.0	Fisher	<0.001*
Balanced diet:						
No	22	20.8	84	79.2		
Yes	8	88.9	1	11.1	Fisher	<0.001*

(*) Statistically significant at p<0.05   (U) Mann-Whitney test

Table 5: Relation between post-intervention elderly' knowledge about aging and nutrition and their socio-demographic characteristics

	Knowledge				X^2 Test	p-value
	Satisfactory		Unsatisfactory			
	No.	%	No.	%		
Age (years):						
<70	73	81.1	17	18.9		
70+	22	88.0	3	12.0	Fisher	0.56
Gender:						
Male	48	88.9	6	11.1		
Female	47	77.0	14	23.0	2.79	0.09

Marital status:						
Married	52	83.9	10	16.1		
Unmarried	43	81.1	10	18.9	0.15	0.70
Education:						
Illiterate/read write	48	71.6	19	28.4		
Basic/Intermediate	33	97.1	1	2.9	--	--
High School	14	100.0	0	0.0		
Job status:						
Not working	93	82.3	20	17.7		
Working	2	100.0	0	0.0	Fisher	1.00
Income:						
Insufficient	48	71.6	19	28.4		
Sufficient	47	97.9	1	2.1	13.44	<0.001*
Crowding index:						
<2	52	92.9	4	7.1		
2+	43	72.9	16	27.1	7.98	0.005*

(*) Statistically significant at p<0.05   (--) Test result not valid

Table 6: Relation between post-intervention elderly' knowledge about aging and nutrition and their medical history, smoking, and nutritional habits

	Knowledge				X^2 Test	p-value
	Satisfactory		Unsatisfactory			
	No.	%	No.	%		
Chronic diseases:						
No	10	90.9	1	9.1		
Yes	85	81.7	19	18.3	Fisher	0.69
Total No. of diseases:						
Mean±SD	1.9±1.0		2.3±0.9		U=3.42	0.06
Smoking:						
No	54	79.4	14	20.6		
Yes	41	87.2	6	12.8	1.18	0.28
Physically active:						
No	13	76.5	4	23.5		
Yes	82	83.7	16	16.3	Fisher	0.49
Self-perception of health:						
Poor	13	81.3	3	18.8		
Fair/good	82	82.8	17	17.2	Fisher	1.00
Cereals:						
<RDA	94	89.5	11	10.5		
RDA	1	10.0	9	90.0	Fisher	<0.001*
Vegetables/fruits:						
<RDA	91	82.0	20	18.0		
RDA	4	100.0	0	0.0	Fisher	1.00
Proteins:						
<RDA	74	78.7	20	21.3		
RDA	21	100.0	0	0.0	Fisher	0.02*
Dairy products:						
<RDA	74	78.7	20	21.3		
RDA	21	100.0	0	0.0	Fisher	0.02*
Balanced diet:						
No	82	80.4	20	19.6		
Yes	13	100.0	0	0.0	Fisher	0.12

(*) Statistically significant at p<0.05   (U) Mann-Whitney test

Table 7 illustrates the presence of statistically significant relations between the attitude of the elderly before the intervention and the marital status p=0.01, education p=0.02, and income p=0.003. As shown in the table, the percentages of positive attitudes were higher among the married and those with sufficient income. It also had an increasing trend with the higher level of education. Concerning the relation between pre-intervention attitude and medical history and dietary habits of the elderly, Table 8 points to statistically significant relations with chronic diseases p=0.002, and their numbers p=0.005, physical activity p=0.001, self

perception of health p=0.04, and the intake according to RDA of cereals p=0.04. As noticed, the percentages of positive attitude were higher among the elderly with no chronic diseases, who were physically active, with fair/good health, and those with intake of cereals less than the recommended daily allowance. Table 9 shows no statistically significant relations between the attitude of the elderly after the intervention and any of their socio-demographic characteristics. As for the relation between post-intervention attitude and the medical history and dietary habits of the elderly, Table 10 shows statistically significant relations with the number of chronic diseases p=0.04, and the intake according to RDA of cereals p=0.01, and proteins p=0.006. It is evident that the percentages of positive attitude were higher among the elderly with lower number of chronic diseases, and those with intake of cereals and proteins less than the recommended daily allowance. The relation between the total knowledge and attitude of the elderly before and after the intervention Table 11 proved statistically significant p<0.001 and p=0.003, respectively. As the table illustrates, higher percentages of the elderly with positive attitude had satisfactory knowledge, and higher percentages of those with negative attitude had unsatisfactory knowledge. Table 12 shows statistically significant positive correlations between the scores of knowledge and attitude at the pre r=0.273 and post 0.422 intervention phases. The table also showes that the knowledge scores were significantly and positively correlated with their education and health perception, and negative correlations with the crowding index and the number of diseases at both phases. Meanwhile, the attitude was positively correlated with the health perception at the pre- phase, and negatively correlated to the crowding index and the number of diseases at the post- phase. Table 13 shows that the statistically significant independent predictors of the scores of knowledge among the elderly were the intervention program, as well as their level of education, income, and health perception. All these factors are positive predictors, with the intervention having the highest impact as indicated by the value of the standardized coefficient. The model explains 64% of the variation in the knowledge score. The best fitting model for the scores of attitude Table 14 indicated that the statistically significant independent predictors among the elderly were the income, number of chronic diseases, physical activity, and knowledge score. All these factors are negative predictors, except for the knowledge score, which had the highest impact as indicated by the value of its standardized coefficient. The model explained 30% of the variation in the attitude score.

Table 7: Relation between pre-intervention elderly' attitudes towards aging and nutrition and their socio-demographic characteristics

	Attitude				X^2 Test	p-value
	Positive		Negative			
	No.	%	No.	%		
Age (years):						
<70	28	31.1	62	68.9		
70+	5	20.0	20	80.0	1.18	0.28
Gender:						
Male	13	24.1	41	75.9		
Female	20	32.8	41	67.2	1.06	0.30
Marital status:						
Married	24	38.7	38	61.3		
Unmarried	9	17.0	44	83.0	6.59	0.01*
Education:						
Illiterate/read write	14	20.9	53	79.1		
Basic/Intermediate	11	32.4	23	67.6	7.75	0.02*
High School	8	57.1	6	42.9		
Job status:						
Not working	33	29.2	80	70.8		
Working	0	0.0	2	100.0	Fisher	1.00
Income:						
Insufficient	12	17.9	55	82.1		
Sufficient	21	43.8	27	56.3	9.13	0.003*
Crowding index:						
<2	19	33.9	37	66.1		
2+	14	23.7	45	76.3	1.46	0.23

(*) Statistically significant at p<0.05

Table 8: Relation between pre- intervention elderly' attitudes towards aging and nutrition and their medical history, smoking, and nutritional habits

	Attitude				X^2 Test	p-value
	Positive		Negative			
	No.	%	No.	%		
Chronic diseases:						
No	8	72.7	3	27.3		
Yes	25	24.0	79	76.0	Fisher	0.002*
Total No. of diseases:						
Mean±SD	1.5±1.0		2.1±0.9		U=7.80	0.005*
Smoking:						
No	19	27.9	49	72.1		
Yes	14	29.8	33	70.2	0.05	0.83
Physically active:						
No	11	64.7	6	35.3		
Yes	22	22.4	76	77.6	Fisher	0.001*
Self-perception of health:						
Poor	1	6.3	15	93.8		
Fair/good	32	32.3	67	67.7	Fisher	0.04*
Cereals:						
<RDA	29	33.7	57	66.3		
RDA	4	13.8	25	86.2	4.21	0.04*
Vegetables/fruits:						
<RDA	33	29.2	80	70.8		
RDA	0	0.0	2	100.0	Fisher	1.00
Proteins:						
<RDA	28	31.5	61	68.5		
RDA	5	19.2	21	80.8	1.47	0.23
Dairy products:						
<RDA	29	27.6	76	72.4		
RDA	4	40.0	6	60.0	Fisher	0.47
Balanced diet:						
No	30	28.3	76	71.7		
Yes	3	33.3	6	66.7	Fisher	0.71

(*) Statistically significant at p<0.05   (U) Mann-Whitney test

Table 9: Relation between post-intervention elderly' attitudes towards aging and nutrition and their socio-demographic characteristics

	Attitude				X^2 Test	p-value
	Positive		Negative			
	No.	%	No.	%		
Age (years):						
<70	53	58.9	37	41.1		
70+	16	64.0	9	36.0	0.21	0.64
Gender:						
Male	36	66.7	18	33.3		
Female	33	54.1	28	45.9	1.89	0.17
Marital status:						
Married	37	59.7	25	40.3		
Unmarried	32	60.4	21	39.6	0.01	0.94
Education:						
Illiterate/read write	40	59.7	27	40.3		
Basic/Intermediate	20	58.8	14	41.2	0.13	0.94
High School	9	64.3	5	35.7		
Job status:						
Not working	68	60.2	45	39.8		
Working	1	50.0	1	50.0	Fisher	1.00
Income:						
Insufficient	37	55.2	30	44.8		
Sufficient	32	66.7	16	33.3	1.53	0.22

Crowding index:						
<2	37	66.1	19	33.9		
2+	32	54.2	27	45.8	1.68	0.20

Table 10: Relation between post-intervention elderly' attitudes towards aging and nutrition and their medical history, smoking, and nutritional habits

	Attitude				X^2 Test	p-value
	Positive		Negative			
	No.	%	No.	%		
Chronic diseases:						
No	9	81.8	2	18.2		
Yes	60	57.7	44	42.3	Fisher	0.20
Total No. of diseases:						
Mean±SD	1.8±1.0		2.2±0.9		U=4.25	0.04*
Smoking:						
No	37	54.4	31	45.6		
Yes	32	68.1	15	31.9	2.16	0.14
Physically active:						
No	9	52.9	8	47.1		
Yes	60	61.2	38	38.8	0.41	0.52
Self-perception of health:						
Poor	12	75.0	4	25.0		
Fair/good	57	57.6	42	42.4	1.74	0.19
Cereals:						
<RDA	67	63.8	38	36.2		
RDA	2	20.0	8	80.0	Fisher	0.01*
Vegetables/fruits:						
<RDA	66	59.5	45	40.5		
RDA	3	75.0	1	25.0	Fisher	0.65
Proteins:						
<RDA	62	66.0	32	34.0		
RDA	7	33.3	14	66.7	7.61	0.006*
Dairy products:						
<RDA	54	57.4	40	42.6		
RDA	15	71.4	6	28.6	1.40	0.24
Balanced diet:						
No	63	61.8	39	38.2		
Yes	6	46.2	7	53.8	1.17	0.28

(*) Statistically significant at p<0.05   (U) Mann-Whitney test

Table 11: Relation between elderly' knowledge and attitudes towards aging and nutrition before and after the intervention

	Knowledge				X^2 Test	p-value
	Satisfactory		Unsatisfactory			
	No.	%	No.	%		
Total attitude (pre):						
Positive (60%+)	17	51.5	16	48.5		
Negative (<60%)	13	15.9	69	84.1	15.52	<0.001*
Total attitude (post):						
Positive (60%+)	63	91.3	6	8.7		
Negative (<60%)	32	69.6	14	30.4	9.08	0.003*

(*) Statistically significant at p<0.05

Table 12: Correlation between elderly' scores of knowledge and attitudes towards aging and nutrition before and after the intervention

	Spearman rank correlation			
	Pre		Post	
	Knowledge	Attitude	Knowledge	Attitude
Knowledge		0.273**		0.422**
Age	0.163	0.071	0.086	0.019
Education	0.472**	0.149	0.538**	0.112
Crowding index	-0.235*	-0.117	-0.423**	-0.217*
No. of diseases	-0.475**	-0.132	-0.430**	-0.265**
Balanced diet	0.272**	-0.017	0.038	-0.158
Health perception	0.479**	0.290**	0.485**	0.101

(*) Statistically significant at p<0.05   (**) Statistically significant at p<0.01

Table 13: Best fitting multiple linear regression model for elderly' scores of knowledge of aging and nutrition

	Un-standardized Coefficients		Standardized Coefficients	t-test	p-value
	Beta	Std. Error			
Constant	.011	3.490		.003	.997
Intervention	22.671	1.712	.527	13.243	<0.001
Education	1.793	.834	.117	2.149	.033
Income	16.558	2.433	.380	6.807	<0.001
Health perception	10.576	1.650	.267	6.408	<0.001

r-square=0.64, Model ANOVA: F=101.42, p<0.001

Table 14: Best fitting multiple linear regression model for elderly' scores of attitudes towards aging and nutrition

	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value
	Beta	Std. Error			
Constant	57.228	10.346		5.532	<0.001
Income	-4.701	2.142	-.149	-2.194	.029
No. of chronic diseases	-2.086	.982	-.132	-2.124	.035
Physical activity	-4.893	2.446	-.112	-2.001	.047
Knowledge score	.396	.049	.548	8.062	<0.001

r-square=0.30, Model ANOVA: F=24.34, p<0.001
          Variables entered and excluded by model: age, sex, marital status, job, crowding index, perception of health, intervention
          Variables entered and excluded by model: age, sex, marital status, job, crowding index, number of chronic diseases, physical activity

Table 15 describes the changes in food frequency among the elderly before and after the study intervention. It shows statistically significant decreases in the frequency of intake of cereals p=0.03 and potatoes p=0.007. On the other hand, statistically significant increases were demonstrated in the intake of vegetables p<0.001, fruits p=0.009, and dairy products p<0.001. Meanwhile, the mean frequency of intake of fluids decreased from 2.3 to 1.9 p=0.01. The pre-post changes in the intake of the main food groups according to recommended daily requirements Table 16 indicated statistically significant decrease in the cereals p=0.001. On the other hand, the intake of dairy products significantly increased p=0.03. No significant changes could be seen regarding vegetables and fruits and proteins. The percentage of elderly taking balanced diet increased from 7.8% at the pre-intervention phase to 11.3% at the post-phase. However, the difference was not statistically significant p=0.37.

Table 15: Pre-post intervention changes in food frequency among the elderly in the study sample

Frequency/day	Time		Mann Whitney test	p-value
	Pre (n=115)	Post (n=115)		
Cereals:				
Mean±SD	3.1±1.1	2.8±0.8		
Median	2.60	2.50	4.63	0.03*
Potatoes::				
Mean±SD	0.4±0.4	0.2±0.2		
Median	0.20	0.10	7.37	0.007*
Sugars/carbohydrates:				
Mean±SD	1.6±0.8	1.5±0.8		
Median	1.10	1.00	1.03	0.31
Legumes:				
Mean±SD	1.0±0.5	1.0±0.5		
Median	0.80	0.80	0.12	0.73
Vegetables:				
Mean±SD	0.4±0.6	1.1±0.8		
Median	0.30	0.80	50.36	<0.001*
Fruits:				
Mean±SD	0.2±0.3	0.3±0.2		
Median	0.30	0.30	6.91	0.009*
Meat/fish:				
Mean±SD	0.5±0.2	0.6±0.2		
Median	0.50	0.50	1.28	0.26
Dairy products:				
Mean±SD	0.8±0.6	1.2±0.7		
Median	0.50	1.30	30.54	<0.001*
Fat:				
Mean±SD	0.8±0.5	0.8±0.4		
Median	0.50	0.70	0.79	0.37
Salt:				
Mean±SD	0.6±0.6	0.6±0.6		
Median	0.40	0.40	0.69	0.41
Fluids:				
Mean±SD	2.3±0.9	1.9±0.8		
Median	2.10	2.00	6.37	0.01*

(*) Statistically significant at $p < 0.05$

Table 16: Pre-post intervention changes in balanced dietary intake among the elderly in the study sample

	Time				x^2 Test	p-value
	Pre (n=115)		Post (n=115)			
	No.	%	No.	%		
Recommended daily intake of:						
Cereals	29	25.2	10	8.7	11.15	0.001*
Vegetables/fruits	2	1.7	4	3.5	Fisher	0.68
Proteins	26	22.6	21	18.3	0.67	0.41
Dairy products	10	8.7	21	18.3	4.51	0.03*

(*) Statistically significant at $p < 0.05$

DISCUSSION

This study was intended to improve elderly nutritional knowledge, attitude and practice. It was carried out to test the research hypothesis that, the implementation of an educational counseling program for

elderly in Abu khalifa Primary Health Care Center, will affect significant improvements in their nutritional knowledge, attitude, and practice.

The study was a quasi-experimental intervention design with pre-post assessment. This research design encompasses a broad range of non-randomized intervention studies. It is frequently used when it is not logistically feasible or ethical to conduct a randomized controlled trial. It is commonly employed in the evaluation of the effectiveness of educational programs when random assignment is not possible or practical [10]. In this design, control is exerted via the comparison of subjects within themselves rather than the traditional comparison of treatment and control groups. The addition of the follow-up test strengthens the design by allowing for an additional comparison and assessing retention of the intended changes. Thus all subjects may undergo the same treatment at one time with pre- and post-testing done to compare differences before and after the intervention with additional follow-up testing to ascertain if any changes seen are lasting over time [11].

The current study was carried out on a sample of elderly people representing high percentage of illiteracy or low level education 72.8%, low income 67%, and high crowding index 59% which matches the local community. In addition, the prevalence of smoking is high among the study participants. This is typical of a rural Egyptian community where a low socio-economic level prevails, and where smoking is part of the culture. The present study sample had a slightly more preponderance of women 61%, which might be explained by their higher life expectancy, compared to men. A similar finding was reported [12] in Malaysia. As expected, the sample had a high percentage of widows, reaching to about two-fifth, and almost all the elderly had no current job. A great majority of the elderly in the current study did have chronic health problems 90.4%; suffering from more than one disease, with an average around two. The figure is lower compared to the elderly in Botswana in which they have an average of 5.2 health problems per elderly person [13]. The lower average in our study could be due to under-reporting of health problems among elderly as pointed out in a study reporting an average of 2.7 morbidities per person, which is close to our figure [14]. Similar high rates of chronic diseases among elderly were reported in Nigeria [14]. The risk of getting these diseases with increasing age is well documented due to the development of age-related pathologies [4]. Hence, people may consider such diseases as a normal process accompanying the advancing age. This is probably the reason why the great majority of the elderly in the study sample consider their health status as fair 70.4% or good 16.7%. However, in disagreement with this [15] suffering from severe chronic illnesses is one of the potent factors resulting in a negative image of ageing. These disparities in self-perception of health among different studies could be related to cultural perception of illnesses and global differences in the prevalence of diseases. Moreover, self-perception of health proved to be significantly associated with mortality among elderly [16]. Therefore, the elderly health self-perception should be acknowledged by clinicians to help the implementation of individual actions intended to promote their health condition [17].

The majority of the elderly in the sample were physically active. Moreover, people in rural areas usually lead less sedentary lifestyles compared to urban areas, and even women help men in agriculture. This might be the reason why our findings were incongruent with a study reporting half of their sample of elderly in Oman took no physical activity [18]. The socio-economic factors might also explain the difference.

The present study demonstrated a major deficiency in the knowledge of the elderly regarding the aging process and related nutritional aspects. Overall, only 26.1% had satisfactory nutritional knowledge before the study intervention. Similar results were reported among the elderly in Malaysia; where more than half of the sample had poor or very unsatisfactory knowledge [19]. Low level of nutritional knowledge in our study may be explained by lack of nutrition information, low educational level and socio-economic characteristics. This is evidenced by the significant association between satisfactory knowledge and higher levels of education and income. In fact, the findings demonstrated that knowledge scores have significant positive correlation with the education level, and negative correlation with the crowding index. Moreover, there is an increasing trend of the percentages of elderly with satisfactory knowledge with increasing levels of education, which is in agreement with a finding showing that the higher the general educational attainment of a subject, the greater his/her nutritional knowledge [20]. No statistically significant association could be revealed between elderly nutritional knowledge and their gender. This disagreed with findings where more females than males had poor nutrition knowledge [12]. On the other hand, in USA it was reported that women were more knowledgeable than men about diet and health, and this was attributed to the difference in culture [21]. Also, no significant relation could be shown between the age of the elderly in the current study and their

nutrition knowledge, which is in disagreement with studies reporting significant differences in nutrition knowledge in older adults compared to younger ones [22, 23]. The lack of such association between age and nutritional knowledge in the present study might be due to the narrow range and the small number of elderly in the age group 70 years or more. Meanwhile, our findings indicated that married elderly had significantly better nutritional knowledge and this might be related to the responsibility of married ones for other family members regarding food provision and preparation. Added to this is the probable positive influence from their educated children. In congruence with this, there is increasing evidence that social support has a positive influence on dietary habits [24]. Thus, family and friends are an important source of instrumental and emotional support, especially for older people [25].

Our study demonstrated that the elderly who are not suffering from chronic diseases have significantly better knowledge. This might be explained retrospectively, i.e. those elderly with better nutritional knowledge might have been at lower risk of developing diet related diseases such as hypertension, cardiac diseases, and dyslipidemias. In the same way, higher percentages of satisfactory knowledge are revealed among those elderly with good self-perception of own health, and with intake of recommended daily allowances of vegetables fruits, proteins and dairy products and of balanced diet. These variables may reflect a better nutritional knowledge affecting their nutritional behavior and habits. The findings are in congruence with studies demonstrating a consistent association between the level of nutritional knowledge, dietary quality and an intention to make positive dietary changes [26]. Nonetheless, the present study showed that the elderly whose intake of cereals was below the recommended daily allowance had more satisfactory dietary knowledge. This might be related to the food habits related to this community where the majority of them eat 2 meals only and this will never cover all the necessary elements needed. The implementation of the counseling intervention to the elderly of the present study led to significant improvement in their knowledge. This was noticed in all the areas assessed as well as in total knowledge. The percentage of those with total satisfactory knowledge increased more than three-fold. A similar improvement was noticed in the nutritional knowledge of African, although the post test percentage of satisfactory knowledge was much lower 41% compared to ours 82.6% [27]. This difference might be explained by the fact that our post test was administered a short time after the intervention program, which might reflect short recall. Nonetheless, our findings match with results stating that the overall increased nutrition knowledge was the most successful outcome of their intervention [28]. On the same line, it was emphasized that appropriate nutrition education interventions need to be implemented to improve the shortcomings of nutrition knowledge among elderly [12]. Therefore, it was recommended that facilities with Elderly Nutrition Programs are ideal settings for nutrition and health promotion interventions in the older adult population [29]. In further confirmation of the positive effect of the intervention program on the knowledge of the elderly in the current study, multivariate analysis demonstrated that the intervention was the strongest independent predictor of the elderly' scores of knowledge. Such interventions need to be simple and consider the low education level of the participants to make sure that the messages can reach the target [30].

Concerning the attitudes towards nutrition in old age, the present study demonstrated a generally low percentage of elderly with total positive attitude before the intervention 28.7%.This rate is far lower than that reported among the Taiwanese elderly being 70% [1]. This difference is undoubtedly related to traditions and cultures since the Taiwanese study reported strong Chinese traditional or food-texture-related dietary restriction attitudes among the studied elderly. Like knowledge, attitudes are influenced by many personal and social factors. The present study demonstrated more positive attitudes among the elderly who were married, and had high levels of education and income. These factors are similar to the factors affecting the knowledge of the elderly due to the same reasons addressed before. The findings are in congruence with earlier reports [1]. However, in disagreement with our findings, they reported better attitudes among the male and younger elderly. Furthermore, the current study revealed that percentages of elderly with pre-intervention positive nutritional attitudes were higher among those with no chronic diseases, who were physically active, with fair/good health, and those with intake of cereals less than the recommended daily allowance. Moreover, the attitude score had a significant positive correlation with the grade of self-perception of own health. The findings are plausible since a better attitude is expected to reflect a more healthy behavior and more health awareness. As for the relation with chronic diseases, the lower positive attitude among those with chronic diseases has been attributed to their being frustrated of not being offered sufficient nutritional counseling by their health care providers [31], in addition to the fact that most chronic diseases appear to lead to dietary restrictions that compromise nutritional status [32].

At the post-intervention phase of the present study, significant improvement was demonstrated in elderly' attitudes towards aging and nutrition. This has been shown in almost all attitude statements. However, the attitudes towards home activities being seen as sufficient exercise and towards reducing sugars in diet did not improve significantly. The latter is difficult to change as a deeply rooted habit in Egypt. Similar post-intervention improvements in the nutritional attitudes such as the avoidance of fat and readiness to increase fiber intake were reported [33]. Knowledge and attitude are inter-related. Nutrition knowledge may influence dietary behavior directly or through nutrition attitudes. As revealed in the present study, both were positively correlated, and the strength of the correlation increased at the post-intervention phase 60%. This indicates that the improvement of knowledge affects similar improvements in attitudes. These findings are in accordance to those observed earlier [1]. Furthermore, the multivariate analysis in the current study demonstrated that the intervention per se had no independent significant effect on the score of attitude, but this took place through improvement in the knowledge score. This turned to be the strongest independent positive predictor of the attitude score. On the other hand, the income, number of chronic diseases, and physical activity were shown to be negative predictors of the score of attitude. This means that the elderly with lower income, lower number of chronic diseases, and lower physical activity benefited more from the intervention. These factors must be taken into consideration in the designing of intervention programs so that they can be custom-tailored to fit the recipients' characteristics and abilities. The knowledge of appropriate health behaviors and related positive attitudes is only one step in improving health-related behavior. The dissemination of nutrition information is only part of the equation, and skill development through increases in instructional knowledge is almost always necessary to produce behavioral changes [34]. Dietary behavior may further become dietary patterns and influence one's nutrient intake [1].

Regarding practice, the current study found a positive effect of the implementation of the health education nutritional program on the self-reported intake for most categories of food items such as the intake of vegetables, fruits and dairy products. However, the intake of other items such as cereals, potatoes, and fluids decreased. Only the intake of dairy products demonstrated a significant increase, while the intake of cereals decreased. The lack of adequate intake of fruits and vegetables according to recommended [4] dietary guideline of a minimum 5-a-day consumption has been documented in a survey of 21 countries which found that only in 3 countries the intake met the minimum WHO recommended consumption [35]. The foregoing present study findings might be explained by the availability of the food items to the participants given the low socio-economic level, and that a large percentage are unmarried and may be living alone, depending on themselves for food preparation. Additionally, many factors may contribute to immobility in old age such as osteoarthritis of the joints, neurological deficit, previous falls and sensory deprivation [36] as well as retirement and the feeling of loneliness [37]. Thus, the dairy products may be the easiest to change given the availability, cost, and readiness to consume with no preparation, as compared to proteins. The improvement in the mean daily dairy products consumption at the post-intervention phase is in congruence reporting increases in the intake of calcium, vitamin D, and a number of other nutrients in the intervention group between the baseline and the end of the intervention [38]. On the same line [16], it was mentioned that the drop in meat and fish consumption among elderly seems to be balanced by a rise in cheese and dairy product consumption, which are softer and easier to chew and swallow. As for the fruits, the present study showed a significant increase in their consumption, but it did not reach the Recommended Daily Allowance RDA. This might be attributed to the fact that their consumption is generally low in our rural communities despite their documented benefits for health [39]. The findings are in congruence with previous studies that demonstrated the effectiveness of dietary interventions in increasing the intake of these food items [40]. The present study demonstrated a significant decrease in the daily consumption of cereals after the intervention program. This might be explained by the attempts to avoid weight gain, considering cereals mainly as sugars although the program stressed the importance of cereal fiber consumption late in life as it is associated with lower risk of incidence of cardiovascular diseases, in addition to their benefits for avoidance of constipation, and positive effect on plasma LDL-cholesterol and glucose [41]. Thus, recommendations support an increase in the consumption of dietary cereal fibers for elderly individuals [42]. Contrary to our finding, it was demonstrated that an increase occurred in the intake from grains group, with a significant improvement in the intake of RDA of cereals [43]. Unfortunately, the implementation of the present study intervention did not lead to significant increase in the daily intake of animal proteins. This could be linked to dental health and mastication problems arising due to missing teeth, denture wearing and decreased biting forces. It could also be attributed to the high cost of this type of food. The finding is in agreement with a report who found that the elderly Taiwanese consumed less poultry and meat than their younger counterparts [44]. According to the present study, the fluid intake among the elderly showed a significant decrease after implementation of the intervention

program. This might be attributed to the change of weather during the study. On the other hand, some food items did not show any improvements after the intervention such as the fat, salt, and sugar. The decrease in salt and sugar intake may be difficult and may need more time and effort to change due to the sensory decrements that can not only reduce the enjoyment of food but can alter food intake. This could be explained in the light of a study reporting that a very important issue is the food preferences since the elderly people are more likely to stick to their traditional food, although they may be forced to change their food preferences due to health reasons [45].

Overall, the results of the present study indicated that the application of the nutritional counseling program yielded positive changes in elderly in terms of their health behaviors, dietary behaviors, nutrient intake, and nutritional risk levels. These changes led to an increase in the number of elderly having balanced dietary regimen; although it did not reach statistical significance, probably due to the short period of the study. It was emphasized that the nutrition education has not only been shown to improve knowledge and skills but also eating and physical activity behaviors [46]. However, although knowledge of appropriate health behaviors helps improve health related behavior, skill development and instructional knowledge are necessary to produce behavior changes [34]. Hence, while there were gains in knowledge and changes in attitudes, not all of these resulted in corresponding improvements in behavior as knowledge and attitude can be changed faster than behavior, and also behavior needs resources so that it can be improved.

CONCLUSION

In conclusion, the implementation of the counseling intervention was effective in improving their knowledge and changing their attitudes to more positive, which led to improvements in their dietary practices. Other factors had positive effects on knowledge as higher levels of education and income, and good health perception, while the income, number of chronic diseases, and physical activity had a negative influence on the change in attitude. The findings lead to acceptance of the study hypothesis. The study recommended more efforts in the provision of nutritional counseling to the elderly through similar interventions, with more community service programs. The family medicine departments should organize training courses for family physicians in comprehensive geriatric assessment and management, with shared training courses for nurses and family physicians to improve their knowledge and skills in the provision of nutritional counseling. Moreover, specialized clinics in the Family Practice Centers to provide All-inclusive Care for the Elderly should be established. The Ministry of Health should launch a Geriatric Healthy Lifestyle Campaign for promotion of healthy eating habits.

REFERENCES

[1]   Lin W, Lee YW. Nutrition knowledge attitudes and dietary restriction behavior of the Taiwanese elderly Asia Pac J Clin Nutr 2005; 14 (3):221-229.
[2]   Geriatric Center Nepal Ramchandra Marg Battisputali-9 Kathmandu Nepal March Status Report on Elderly People 60+ in Nepal on Health Nutrition and Social Status Focusing on Research Needs Government of Nepal Ministry of Health and Population Ramshahpath Kathmandu 2010.
[3]   Outram K Cook R Bagnulo Jand Lincoln W. Trends in nutritional risk and effect of nutrition among low income elderly in MaineJ Nutr Eld 2002; 4: 3-19.
[4]   WHO. Keep Fit for Life: Meeting the Nutritional Needs of Older Persons Geneva Switzerland: World Health Organisation 2002.
[5]   Wakimoto Pand Block G. Dietary intake dietary patterns and changes with age: an epidemiological perspective J Gerontol A Biol Sci Med Sci 2001; 56:S65–S80.
[6]   Sachdeva R Grewal S Kochhar A and Chawla P. Efficacy of Nutrition Counselling on Knowledge Attitudes and Practices of Urban and Rural Elderly Males Stud Home Comm Sci 2008; 21: 65-68.
[7]   Tabloski PA. Challenges of Aging and Cornerstones of Excellence in Nursing Care In: Gerontological Nursing 87-343 Pearson Education ISBN 978-0-13-503810-9 New Jersey USA 2010.
[8]   Lee J and Frongillo E. Factors associated with food insecurity among US elderly persons: importance of functional impairments J Gerontol B Psychol Sci Soc Sci 2001; 562:S94-99.
[9]   Field L and Smith B. Nursing Care: an essential guide Prentice Hall Harlow. 2008.
[10]   Harris A McGregor J Perencevich E Furuno J Zhu J Peterson D and Finkelstein J. The Use and Interpretation of Quasi-Experimental Studies in Medical Informatics J Am Med Inform Assoc 2006; 131: 16-23.

[11] Hunter D. Daniel and the Rhinoceros Evaluation and Program Planning 2006; 29: 180-185.

[12] Norimah A, Karim Safii N, Yusof S, Noor N, Ahmad Zand, Siong T. Nutrition Knowledge Among Malaysian Elderly Tahap Pengetahuan Pemakanan di Kalangan Warga Tua di Malaysia Jurnal Sains Kesihatan Malaysia 2008; 6 (2): 43-54.

[13] Clausen F,,Sandberg E, Ingstaad B, Hjortdan P. Morbidity and healthcare utilization among the elderly people in Mmankgodi village J Epidemiol Community Health 2000; 54:58–63.

[14] Adebusoye L, Ladipo M, Owoaje E, Ogunbode A. Morbidity pattern amongst elderly patients presenting at a primary care clinic in Nigeria African Journal of Primary Health Care & Family Medicine North America 3 Apr 2011Available at: <http://wwwphcfmorg/indexphp/phcfm/article/ view/211/235>.

[15] Chow N, Bai X. The Effects of Sociodemographic Characteristics on Chinese Elders' Perception of the Image of Ageing International Journal of Population Research 2011; volume 20 Article ID 642874 11 pages.

[16] Rejeski W, Mihalko S, Ambrosius W, Bearon L, McClelland J. Weight loss and self-regulatory eating efficacy in older adults: the cooperative lifestyle intervention program The Journals of Gerontology Series B: Psychological Sciences and Social Sciences 2011; 663: 279–286.

[17] Tavares D, Guidetti G, Saúde M. Características sócio-demográficas condições de saúde e utilização de serviços de saúde por idosos Rev Eletrônica Enferm 2008;102: 299-309.

[18] Al Riyami A, Al Hadabi S, Abd El Aty M, Al Kharusi H, Morsi M, Jaju S. Nutrition knowledge beliefs and dietary habits among elderly people in Nizwa Oman: implications for policy Eastern Mediterranean Health Journal 2010; Vol 16 No 8.

[19] Nur Asyura Adznam S, Shahar S, Rahman S, Yusof N, Arshad F, Yassin Z, Salleh M, Samah A, Sakian N. An action research on promotion of healthy ageing and risk reduction of chronic disease: a need assessment study among rural elderly Malays care givers and health professionals J Nutr Health Aging Dec 13, 2009; 10: 925-930.

[20] Riedger N, Moghadasian M. Patterns of fruit and vegetable consumption and influence of sex age and sociodemographic factors among Canadian elderly Am Coll Nutr 2008; 27: 306-313.

[21] Shepherd R, Towler G. Nutrition knowledge attitudes and fat intake: application of the theory of reasoned action Journal of Human Nutrition and Dietetics 2007; 203:170.

[22] Crawford D, Baghurst K. Diet and health: a national survey of belief behaviours and barriers to change in the community Australian Journal of Nutrition and Dietetics 1990; 47: 97-104.

[23] Parmenter K, Wardle J. Development of a Nutrition Knowledge Questionnaire European Journal of Clinical Nutrition 1999; 53 298–308.

[24] Shaikh A, Yaroch A, Nebeling L, Yeh M, Resnicow K. Psychosocial predictors of fruit and vegetable consumption in adults a review of the literature Am J Prev Med 2008; 34: 535-543.

[25] De Andrade F, Junior AC, Kitoko P, Zandonade E. The relationship between nutrient intake dental status and family cohesion among older Brazilians Cad Saúde Pública Rio de Janeiro 2011; 271:113-122.

[26] Probart C, Davis L, Hibbard J, Kime R. Factors that influence the elderly to use traditional or non-traditional nutrition information sources Journal of the American Dietetic Association 2000; 891: 1758-1762.

[27] Jacy C Wade. A fruit and vegetable nutrition education intervention in northeast Georgia older americans act nutrition programs improves intake knowledge and barriers related to consumption A Thesis Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree master of Science Athens Georgia. 2003.

[28] Sahyoun N, Pratt C, Anderson A. Evaluation of nutrition education interventions for older adults: a proposed framework Journal of the American Dietetic Association 2004; 104: 58-69.

[29] Millen B, Ohls J, Ponza M, McCool A. The Elderly Nutrition Program: An effective national framework for preventive nutrition interventions Journal of the American Dietetic Association 2002; 102: 234-240.

[30] Patacca D, Rosenbloom C, Kicklighter J, Ball M. Using a focus group approach to determine older adults' opinions and attitudes towards a nutrition education program J Nutr Elder 2004; 233: 55-72.

[31] Mahler M, Sarvimäk A. Appetite and falls: Old age and lived experiences Int J Qualitative Stud Health Well-being 2012; 7: 11540.

[32] Shatenstein B. Impact of health conditions on food intakes among older adults Journal of Nutrition for the Elderly 273_4 333_361 Retrieved February 19 2012 from http://wwwncbinlmnihgov/pubmed/19042579. 2008.

[33]   Taylor-Davis S, Smiciklas-Wright H, Warland R, Achterberg C, Jensen GL, Sayer A, Shannon B. Responses of older adults to theory-based nutrition newsletters J Am Diet Assoc 2000; 100:656-664.

[34]   Krinke UB. Effective nutrition education strategies to reach older adults In R R Watson Ed The Handbook of Nutrition in the Aged Boca Raton FL CRC Press. 2001.

[35]   International Agency for Research on Cancer IARC. Handbook of Cancer Prevention France: Lyon IARC Press 2003.

[36]   Shiotani I, Sato H, Kinjo K et al. Depressive symptoms predict 12-months prognosis in elderly patients with acute myocardial infarction J Cardiovasc Risk 2002; 9:153-160.

[37]   Charlson M, Peterson J. Medical comorbidity and late life depression what is known and what are the unmet needs? Biological Psychiatry 2002; 52: 226-235.

[38]   McCamey M, Hawthorne N, Reddy S, Lombardo M, Cress M, Johnson M. A statewide educational intervention to improve older Americans' nutrition and physical activity Family economics and nutrition review 2003; v 15 no 147-157.

[39]   Harding A, Wareham N, Bingham S, Khaw K, Luben R, Forouhi N. Plasma vitamin C level fruit and vegetable consumption and the risk of new-onset type 2 diabetes mellitus: the European prospective investigation of cancer-Norfolk prospective study Arch Intern Med 2008; 168: 1493-1499.

[40]   Di Noia J, DiBello J, Prochaska J. Dietary stages of change and decisional balance: a meta-analytic review Am J Health Behav 2010; 34: 618-632.

[41]   Aller R, de Luis D, Izaola O, La Calle F, del Olmo L et al. Effect of soluble fiber intake in lipid and glucose levels in healthy subjects: a randomized clinical trial Diabetes Res Clin Pract 2004; 651: 7-11.

[42]   Mozaffarian D, Kumanyika S, Lemaitre R, Olson J, Burk J, Siscovick D. cereal fruit and vegetable fiber intake and the risk of cardiovascular disease in elderly individuals JAMA 2003; 289: 1659- 1666.

[43]   Herman P, Widdows C, Lucas J, Heip C. Stable isotopes as trophic tracers: Combining field sampling and manipulative labelling of food resources for macrobenthos Mar Ecol Prog Ser 2000; 204: 79–92.

[44]   Shin-Jiuan Wu, Chang Y, Wei I, Kao M, Lin Y, Pan W. Intake levels and major food sources of energy and nutrients in the Taiwanese elderly Asia Pac J Clin Nutr 2005; 14 (3): 211-220.

[45]   Shahar S, Chee K, Wan Chik W. Food intakes and preferences of hospitalised geriatric patients BMC Geriatrics 2002; 2:3.

[46]   Belansky E, Romaniello C, Morin C et al. Adapting and implementing a long-term nutrition and physical activity curriculum to a rural low-income biethnic community J Nutr Educ Behav 2006; 38: 106-113.