Impact Of Educational Program About Nutrition That Enhances The Immunity Among Older Adults At Qena City, Egypt

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Abstract

Background: Immunity age related changes make elderly riskier for infectious diseases. Consequently, it increases morbidity, irreversible frailty and dependency. Diet is recognized to modulate immune functions in several modes and to affect host resistance to infections.
Objective: The study aimed to improve the knowledge of older adults about the nutritional elements and its sources that support and increase the immune response.
Research design: Quasi experimental research design.
Setting: The study was conducted at an elderly club at Qena city, Egypt.
Subjects: A convenient sample of 106 older adults from an elderly club was randomly assigned equally into either the intervention group or the control group.
Method: The educational sessions were implemented over five weeks. Knowledge on nutritional elements were measured at baseline, immediately after the intervention and three months later.
Results: Immediately after the intervention, the percentage of elderly with 'good' knowledge increased from 0% to 90% in the intervention group (p=0.001). While this dropped to 46% at follow up, percentage of elderly in the intervention group with 'fair' knowledge was high at 48%. Age-related cognitive ability might have contributed to this difference.
Conclusion: The nursing intervention improved knowledge and nutritional habits of the elderly.
Keywords: Educational program, Nutrition, Older adults, Immunity

Key points

- Quasi experimental research was used to conduct the nursing educational sessions about knowledge of older adults regarding nutrition that enhance immunity.
- The nursing educational intervention is effective for improving knowledge about nutrition that enhance the immunity among elderly
- There was no statistically significant differences between subjects' level of knowledge at pre, post, and follow up test (P-value = 0.939) in the control group.
- The vast majority of the subjects (94.0%) had poor knowledge level at pre-test (baseline) which reduced to zero at immediate post-test.

Receive Date : 25/11/2020	Accept Date: 28/11/2020	Publish Date : 1/12/2020

Introduction

Aging is described as a series of processes that promote vulnerability to challenges, thereby increases the likelihood of death **(1)**. There is evidence that frail immunity can increase the probability of death **(2)**. Immunesenescence (immunity age related changes) is an important part of the aging process **(3, 4)**. Immunesenescence increases susceptibility to infectious diseases such as influenza and pneumonia which leads to morbidity, irreversible frailty and dependency **(5)**. These burdens in developing countries such as Egypt is a major public health challenge and cost **(6)**.

Nutrition is one of many interrelated factors with immunesenescence. The role of both macronutrients and micronutrients in the immune response as well as their deficiency has been reported by researchers **(3, 7)**. Studies reported the association between undernutrition and protein deficiency and declines in immunity' parameters (specific and non-specific) such as a changed number of T-cells, phagocytic cells, and secretory immunoglobulin (Ig) A antibody response **(8, 9)**. The interactions between nutrition and the immune system have clinical, practical, and public health importance **(7, 10)**.

In Egypt, many studies confirmed that the micronutrient (minerals and vitamins) intake was found to be lower than the recommended dietary allowance among elderly people who have poor nutritional status **(11-13)**. According to the World Health Organization (WHO), the proportion of old individuals (over the age of 60 years) will rise to 22% of the world population by 2050 **(14)**. Regarding, State Information Service (SIS), Egypt is rapidly aging in its demographic structure. The total percent of older adults aged 60 years and above has increased to 6.9 in 2016 from 6 percent in 2010 **(15)**. According to WHO, the life expectancy in Egypt also increased to 69 years for male and 73 years for female **(16)**.

Many research in Egypt assessed the older adults' nutritional status and found that elderly nutritional intake is unsatisfactory and lower than recommended dietary allowance due to lack of knowledge **(11, 12, 17)**. Many studies recommend that education intervention be introduced to increase immunity, prevent disease and promote health **(18, 19)**.

Although researchers showed that nutritional educational intervention is needed in Egypt to improve nutritional intake of elderly in order to improve their immunity, there is a lack of nutrition education intervention among elderly in Egypt **(20-22).** This study aimed to increase older adults knowldeg about the nutrition that enhance their immunity by implementing an educational intervention. The knowledge of older adults about the nutritional elements and its sources that support and increase their immune

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Print ISSN 2636-3224
Online ISSN 2636-3232

response was evaluated as the outcome at Qena city.

SUBJECTS AND METHOD

A) Research design: Quasi experimental research design.

B) Research hypothesis: Knowledge of the community-dwelling older adults on nutrition and immune functions will increase after completion of the program.

C) Setting: The study was conducted at an elderly club, the only elderly club at Qena city, Egypt. The club provides many services for older adults from any socio-economic class, including recreational activities and health services (medical & physiotherapy).

D) Sample size:

- ***Sample selection technique***

A convenient sampling technique was used to recruit participants. The study included all elderly members at Qena Elderly club from both sex according to the following inclusion criteria:

1. Aged 60 years and older.
2. Free from any mental diseases according to their score of Mini-Mental State Examination scale (he/she must obtain 24-30 score).

E) Tool of the study: <u>Structured interview form</u>:

This tool was developed by the researcher based on relevant literature. Applicability and clarity of the tool was tested for its content validity by five nursing and medical experts in the related fields and it was valid 0.96.

Concerning validity calculation, the total number of the tool questions are 55 and each question was rated from 1 to 5 degree.

Validity equation is the total number of questions which got 3 to 5 degree from each one of the jury committee (54 + 52 + 53 + 51 + 54 = 264) divided by the total number of the questions multiple by jury numbers (55 x 5 = 275).

Validity = 264 ÷ 275 = 0.96

Its reliability was measured by Cronbach's Alpha and it was reliable 0.90. This tool was translated into Arabic by the researcher. It consists of three parts.

<u>Part one</u>: Socio-demographic data:

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

<u>Part two</u>: Knowledge of older adults regarding immune system.

This part includes a set of questions concerning immune system, immunity response, and age-related changes in the immune system and type of immunity.

<u>Part three</u>: Knowledge of older adults regarding nutritional elements that enhance immunity:

This part includes a set of questions concerning macronutrients and micronutrients that enhance the immunity, and other food which has vital effects on immunity such as the

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Print ISSN 2636-3224
Online ISSN 2636-3232

best sources of carbohydrate, and benefits of carbohydrate in the immunity.

Questions related to knowledge level (part two and three) contains eleven open questions (which were scored as incorrect answer = 0, incomplete but correct answer = 1 and complete and correct answer = 2) and forty-four multiple choice questions (scored according to the number of correct answers). The maximum score is 90 points. Knowledge points were categorized into three categories:

- Poor knowledge (<50 % correct)
- Fair knowledge (50-69 % correct)
- Good knowledge (≥70 % correct).

The Health Education Program

The educational program was developed and implemented by the researcher for older adult's knowledge regarding nutrition that enhances their immunity. Booklet, brochures, and posters were used to clarify the information. The information was designed to suit the older adults' abilities and capabilities using large bold font and colours with high contrast for older adults to see and read easily. The information also contained images with true and false signs to suit illiterate participants.

A. Implementation phase:

The intervention group was divided into two groups; male group (29) and female group (24). The researcher gave the sessions in 2 days for male group and other 2 days for female group per week. The educational program was implemented over five weeks. The total number of intervention group was 53 in the intervention group but three of them dropped out after the second session so, 50 participants completed the study. The total number of sessions was 10; one session per day and two sessions per week for each intervention group. Each session continued for about one and a half hour. The total sessions time was 15 hours for each intervention group. The control group attended only at the time of pre-test, posttest and follow up test. The research motivated the subjects in both groups by free measuring blood pressure and blood glucose level every time for each elderly.

B. Evaluation phase:

Immediately after the five-week intervention, knowledge about immune system and nutritional elements that enhance the immunity was measured in both groups. At the three-month follow-up, the same tool was used to assess knowledge about immune system and nutritional elements that enhance the immunity.

Ethical consideration: The study was approved by the College of Nursing, Assiut University, Egypt. Permission to carry out the study was obtained from the Director of the elderly club after explaining the purpose of the study. Because obtaining a written consent in Egypt is so difficult, a verbal consent from elders to participate in the study was obtained after explanation of the study purpose.

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

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Print ISSN 2636-3224
Online ISSN 2636-3232

The privacy of each elderly patient was maintained. There was no risk to the participants from attending the educational sessions or using 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.

Descriptive statistics of gender, marital status, and educational level, were described using frequency. Knowledge level of poor, fair and good was described using frequency (n) and percentage (%). Chi-square (x^2) and Fisher exact tests were used to test associations between the categorical variables and significance was considered at $p < 0.05$. Independent sample T-test was used to test if the knowledge score was different between the two groups.

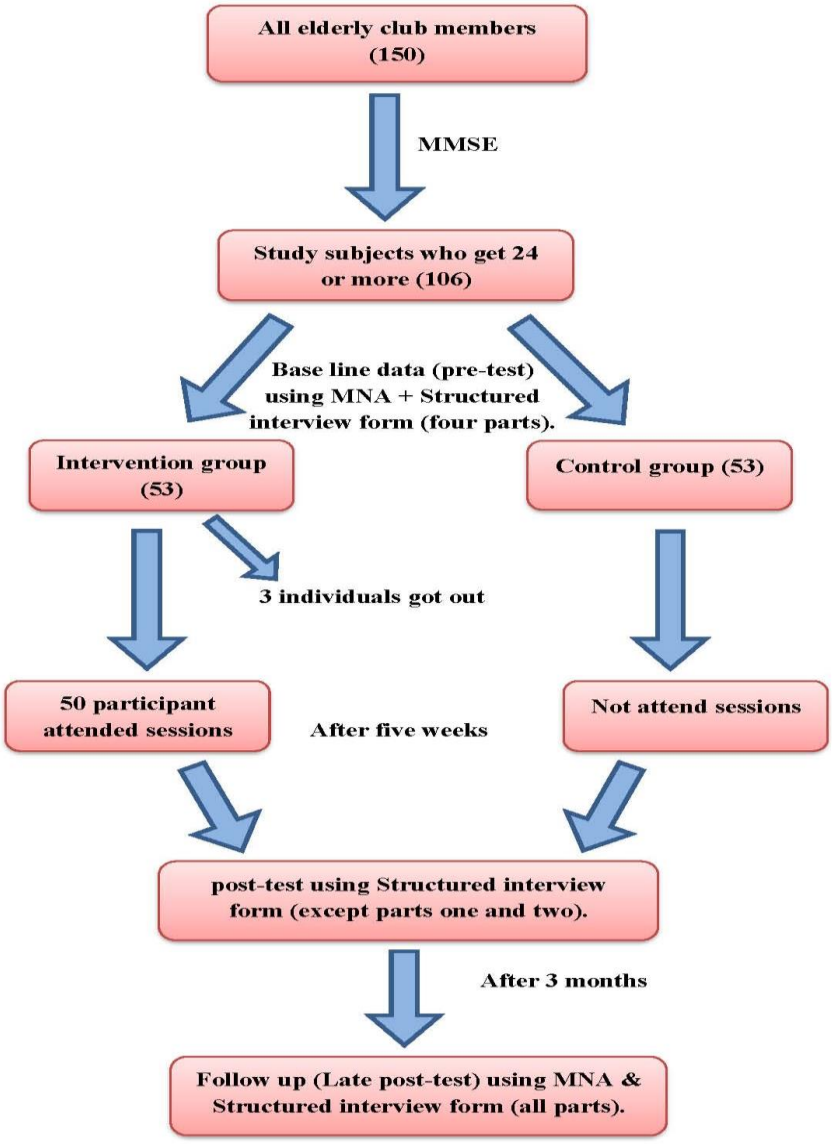

Figure 1: Recruitment process

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Results

Part I: Sociodemographic characteristics of the study subjects

Table 1 Sociodemographic characteristics of the study subjects.

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

* Significant at < 0.05

Sociodemographic characteristics of the intervention and the control group were showed in table 1. The demographics of the two groups were similar except for monthly income (p = 0.012). More of the elderly from the control group had 'adequate' monthly income.

Figure 2 illustrates the level of subjects' knowledge at baseline, immediate post, and 3-month follow up within the intervention group and the control group. Within intervention group, it is noticed that, the vast majority of the subjects (94.0%) had poor knowledge level at pre-test (baseline) which reduced to zero at immediate post-test. Also, no one had good level of knowledge at pre-test but this level raised to ninety percent (90.0%) at immediate post-test. Such knowledge in retained at the

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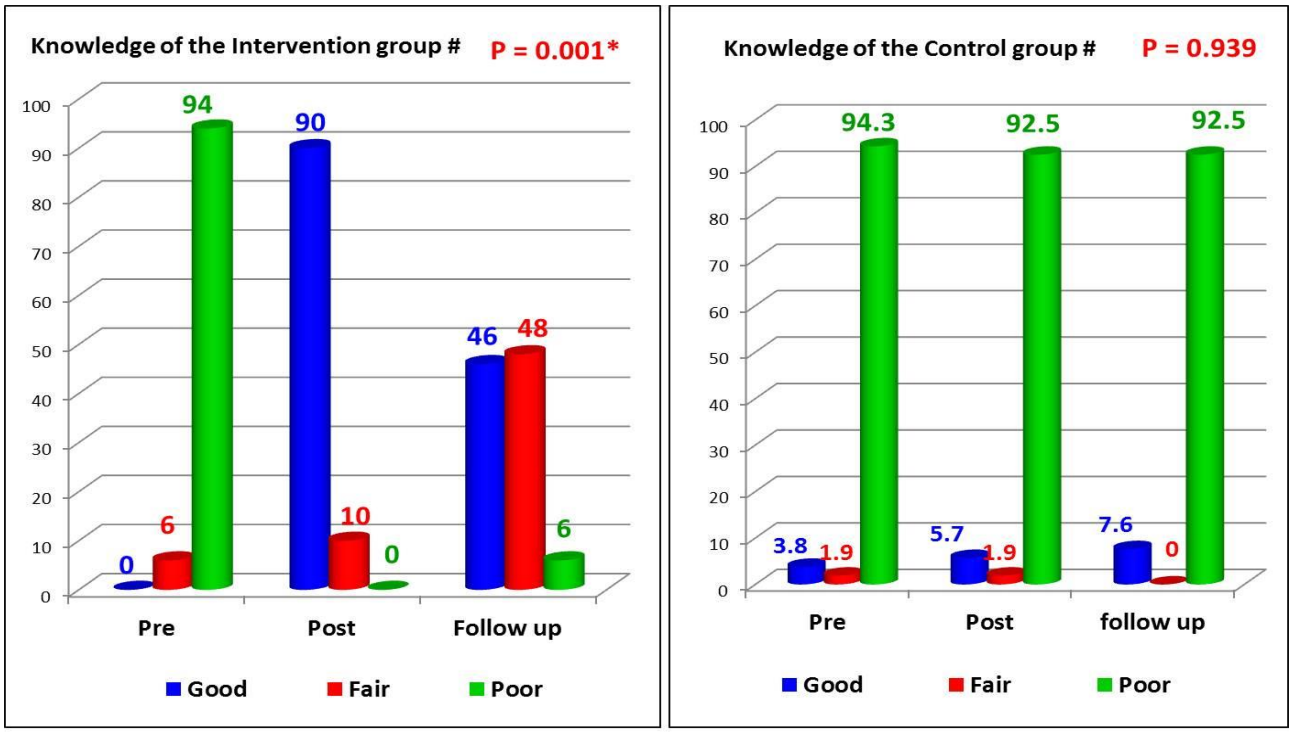
Print ISSN 2636-3224
Online ISSN 2636-3232

3-month follow up among nearly half of the subjects (46%) while level of fair knowledge improved from 10% at immediate posttest to 48% at 3-month follow up. These changes are statistically significant (p-value = 0.001) There was no statistically significant differences between subjects' level of knowledge at pre, post, and follow up test (p-value = 0.939) in the control group.



* P value be significant at ≤ 0.05 and it is from fisher exact test.
# Knowledge of subjects about immunity and how nutrition enhance immunity.
Poor < 50 % correct answers, Fair = 50 to < 75 %, Good = 75 % to higher.

Figure 2 Knowledge about nutrition that enhance the immunity of the intervention and the control groups across three time points

Table 2 Mean difference of knowledge score (post-pre, follow up – pre) between the intervention and control group.

Group	Difference of knowledge score					
	Post - pre			Follow up- pre		
	Mean	95% CI	p-values*	Mean	95% CI	p-values *
Intervention	4.05	3.96 : 4.13	***0.001****	3.86	3.78 : 3.95	***0.001****
Control	2.00	1.42 : 2.58		1.57	1.01 : 2.12	

* p< 0.05 as reported from independent samples t-test after transformation using natural logarithm.

Mean difference of knowledge score (post-pre, follow up – pre) between the intervention and control group is shown in Table 2. Difference between the intervention and control group at both "post-pre" and "follow up –pre" were significant (p-values = 0.001 for both).

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Print ISSN 2636-3224
Online ISSN 2636-3232

Table 3 Association between age categories and knowledge level of the study subjects.

Age categories	Test	Knowledge level												
		Intervention group N= 50							Control group N= 53					
		Poor		Fair		Good		p-value *	Poor		Fair		Good		p-value *
		No	%	No	%	No	%		No	%	No	%	No	%	
From 60 to 64	Pre	26	55.3	1	33.3	0	0.0	0.588	21	42	0	0.0	2	100.0	0.184
From 65 and above		21	44.7	2	66.7	0	0.0		29	58	1	100.0	0	0.0	
From 60 to 64	Post	0	0.0	3	60.0	24	53.3	1.000	20	40.8	0	0.0	3	100.0	0.076
From 65 and above		0	0.0	2	40.0	21	46.7		29	59.2	1	100.0	0	0.0	
From 60 to 64	Follow up	1	33.3	9	37.5	17	73.9	0.024 *	20	40.8	0	0.0	3	75.0	0.305
from 65 and above		2	66.7	15	62.5	6	26.1		29	59.2	0	0.0	1	25.0	

Among the intervention group, as shown in Table 3, there is no significant association found between age categories and knowledge levels at both pre-and post-measurements ($p > 0.05$). However, a statistical significant association between age categories and knowledge levels at the 3-month follow-up was noted (p-value = 0.024) where more 60-64 years old elderly had 'good' knowledge than those 65 years old or older. No significant association between age categories and knowledge levels were found for the control group at all the three time points ($p > 0.05$).

Discussion

Nutrition plays a pivotal role in health promotion, diseases prevention, and chronic diseases management. It is the first line to maintain and improve the immunity of older adults **(3, 25, 26)**. Studies in less developed Arab countries especially Egypt had confirmed that nutritional habits are unhealthy among young and old people and that they lack knowledge about healthy diet that enhance the immunity. Meanwhile, there is a lack of health educational program about nutrition and healthy nutritional habits that enhance the immunity **(11, 12, 17)**.

The present study reported that the nursing educational intervention is effective for

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Print ISSN 2636-3224
Online ISSN 2636-3232

improving knowledge about nutrition that enhance the immunity among older adults. The effectiveness happen after one month however after 3 months the recovery fall almost a half. This is evidenced by ***first***; at Pre-test, most of the intervention participants didn't know the relation between nutrition and immunity, the nutrients types, protein sources, protein benefits to immunity, the best protein sources to immunity, the best sources of carbohydrate for immunity, effects of carbohydrate on immunity, fiber sources, fiber effects on immunity, the effects of heating on fats, useful fat sources, omega 3, 6 sources, the most common vitamin B, A, and E sources, the most common sources of iron, selenium, calcium &magnesium, and zinc, the effects of garlic, honey, olive oil and black cumin on the immunity while at post-test, most of the intervention participants known well the previous mentioned knowledge items.

Similar to the present study, Hegazy et al (2013) conducted their study at El Haram dialysis Centre, Giza, Egypt to identify malnutrition problems and assess the effect of dietary counseling on improvement of health status of end-stage renal disease elderly patients aged 60 years and above. There were improvements in all items of knowledge post-intervention. “Don’t know” responses decreased dramatically from 82.9% to only 5.4% after the intervention **(22).**

According to the following studies in United states, the nutritional education program improves the nutritional knowledge of the older adults the same as reported in this study. Jung (2014) has implemented the program, " Journey through Health " using the Health Belief Model and provided information on how the overarching Dietary Guideline Consumer Brochure messages can positively influence nutrition and physical activity choices. Nearly two thirds of participants increased their rankings of the four questions evaluating older adults’ perceived benefit of nutrition and physical activity in health promotion **(27)**. Kim et al (2012), assessed the improvement in nutritional status following the application of nutrition education program to elderly patients in a long-term care hospital and they concluded that of the twelve questions, scores for ten increased with statistical significance ($P < 0.05$) **(19)**.

Second; dramatically increasing knowledge level of the vast majority of intervention group from poor level at pre-test to good level at post-test and nearly half of them maintaining fair level at follow-up with highly statistically significance. The same finding was confirmed by El-sol et al (2016), who conducted their study at

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Print ISSN 2636-3224
Online ISSN 2636-3232

Menoufia University Hospital, Egypt to determine the effect of educational nursing intervention about osteoporosis on knowledge of older adults. They confirmed that all of the studied subjects had inadequate knowledge in the pre educational intervention while after the nursing educational intervention program, three quarters of them were adequately educated, and only quarter were inadequately educated **(20)**

Third; the mean difference of knowledge score (post-pre, follow up-pre) between intervention and control group indicates highly significance (P=***0.001)*** which means that the intervention participants gain more knowledge from the program sessions and their knowledge score increase at post-test compared to baseline score and at follow-up test compared to baseline score too. The high level of participation and interest in this study may also suggest that participants were highly interested to improve their nutrition knowledge and dietary habits to improve their immunity and nutritional status as mentioned by most of them. This finding is in agreement with previous study in which Abd Allah et al (2015) assessed the effectiveness of diet therapy program on dietary knowledge and practice of 90 elderly patients at Zagazig University Hospitals, Egypt. The researchers reported that the total knowledge of the elderly patients showed statistically significant improvements after the intervention (61.1%) compared with 18.9 % before intervention (p <0.001) **(21)**.

At the three-month follow up, significant association between knowledge levels and age groups, were observed in this present study. This can be explained by the age-related reduction in memory functions.

Limitation of the study

There are a few limitations of the present quasi-experimental study. Firstly, this was done in one single location. Secondly the follow-up period was relatively short. Nevertheless, the study used validated tool and had good participation rate, suggesting it has good internal validity.

Conclusion

Based on the results of the present study, it was concluded that the nursing intervention improved knowledge and nutritional habits of the elderly in a short time after intermediation. The knowledge level increased after completing the nutritional intervention among the study group.

Declaration

Consent for publication

N/A

Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable

Published by : NILES
Print ISSN 2636-3224
Online ISSN 2636-3232

request.

Competing interests

The authors declare that they have no competing interests.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authors' contributions

- Nadia Omar Emam Abdelnasser assigned the study tool (structured interview form), collected, entered, and analyzed data, and wrote the manuscript.
- Prof. Hoda Diab Fahmy Ibrahim revised the study tool as well as the whole manuscript.
- Dr HuiJun Chih provided statistical consultation to the analyses, assisted in the interpretation of the results and contributed to the draft of the manuscript.
- Dr Asmaa Kamal Hassan revised the manuscript.
- Prof. Mohamed Kamal Alsayed Youssef suggested the design of the study.

Acknowledgements

The authors acknowledge all participants of the study and the administrative staff of Elderly Club for their cooperation and help.

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Print ISSN 2636-3224
Online ISSN 2636-3232

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Print ISSN 2636-3224
Online ISSN 2636-3232

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Print ISSN 2636-3224
Online ISSN 2636-3232