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Effect of Educational Program on Mild Cognitive Impairment among Older Population

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Abstract

Mild cognitive impairment (MCI) is common in the older population, with a lifetime progression rate into dementia of 60% to 65%, which has highlighted the importance and realistic value of educational programs to prevent and manage MCI. Purpose: This study aimed to evaluate the effect of educational program on mild cognitive impairment among older population. This randomized control trial study was conducted during 2022-2023 at Kafr Elhag Hassan, Sharkia governorate. Sample: The study sample composed of 80 elderly with MCI, purposively assigned according to study inclusion criteria, randomly assigned into two groups. The study group (n=40) received six sessions, and the control group (n=40) didn't receive any intervention. Three tools were used; Demographic data questionnaire, medical history. The Modified Mini- Mental State Test (3ms) (Arabic version) (pre- post), & questionnaire to assess knowledge regarding cognitive impairment (pre - post). The study findings showed statistically significant improvements in the study group's MMSE score, MCI knowledge compared to the control group Also, MMSE score of the study group after the intervention positively correlated to MCI knowledge (r = 0 .750). The educational program was effective and could be used to improve mild cognitive impairment among older population.

Keywords: Educational Program, Mild cognitive impairment (MCI), Mini Mental Scale Examination (MMSE), MCI Knowledge, Older population.

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1. Introduction

At the biological level, ageing results from the impact of the accumulation of a wide variety of molecular and cellular damage over time. This leads to a gradual decrease in physical and mental capacity, a growing risk of disease and ultimately death. These changes are neither linear nor consistent, and they are only loosely associated with a person's age in years [1]. The Central Agency for Public Mobilization and Statistics showed that the number of elderly people in Egypt is about 7 million, representing 7.1% of the total population on January 1, 2020, and this percentage is expected to rise to 17.9% in 2052 [2]. Mild cognitive impairment (MCI) is common in the older population, with a lifetime progression rate into dementia of 60% to 65%, which has highlighted the importance and realistic value of management of MCI in the context of global aging. Mild cognitive impairment (MCI) is best understood as a putative prodromal or transitional state whereby individuals present with an intact ability to carry out routine everyday activities but present with reduced performance on selected neuropsychological tests suggesting an increased risk for the development of dementia [3]. According to published literature, there are three groups of outcomes of MCI by pathogenesis: revision to normal aging, stability, or progress into dementia. Daily activities and physical functions may play an important role in the reversion of MCI to normal aging [4]. Nurses assigned to gerontological care, therefore, play an important part in helping older persons adjust their lifestyles, as a delay mechanism against dementia. Such adjustment can be through physical activities and dietary modifications, both of which older persons are required to practice on a regular basis over a long period of time for the purpose of delaying dementia onset [5].

2. Methods

Study Design and Setting

A randomized control trial design was used to conduct the current study from November 2022 up to the end of August

2023 at Kafr Elhag Hassan village, Sharkia governorate.

***Sample*:**

The sample of this study included 80 elderly (40 elderly in study group &40 elderly in control group) who fulfilled the following criteria: Elderly who able to cooperate and agree to participate in the study, elderly who diagnosed with mild cognitive impairment (take score of ≥ 78% in MMSE scale), The enrolled elderly were randomly allocated in a 1:1 ratio to the study or control group. Study group received the educational program while the control group did not receive any intervention.

Sample size calculation

The sample size was calculated by software Epi-info package at level of confidence 95%, margin of error 5% and power of test were 80%, assuming average mild cognitive among elderly is 27.5 % from 366 **[6].** Elderly at kafr elhag hassan, and the least percentage of improvement after the intervention program will be 10% then the sample should include **73** elderly in addition to 10% dropout, final sample size will be 80 elderly (40 elderly in study group &40 elderly in control group).

Tool of data collection

Three tools were used for collection of data. **Tool I:** that was developed by the researchers based on the literature review. It is composed of two parts: Demographic characteristics, medical history**.**

Tool II:: The Modified Mini- Mental State Test (3ms) (Arabic version) after validity and modified [7] (Pre - post):

Is a screening tool used to assess a broader variety of cognitive domains and covers a wider range of difficulty levels. The 3(MS) extended the scope of The Mini-Mental State Examination (MMSE). It is a global measure of cognitive abilities tapping domains such as attention, concentration, orientation, to time and place along term and short-term memory, language ability, constructional praxis, abstract thinking, and list generating fluency.

Scoring system:

The score of the 15 items (13 items for illiterates) were summed up and the cognitive abilities (3MSE) were classified according to the total score gained by the elderly in the test as follows:

- Mild cognitive impairment: ≥ 78%
- Moderate cognitive impairment: 60-77%
- Severe cognitive impairment :< 60%

Tool (III): questionnaire to assess knowledge regarding cognitive impairment (pre - post):

This questionnaire was developed by the researcher after returned to related literature review to suit eastern customs and traditions, as well as this age group. It includes questions as (definition of cognitive impairment & signs & symptoms of cognitive impairment, risk factors & prevention of cognitive impairment.

The educational program intervention

Assessment phase:

This phase involved the pre-intervention data collection for baseline assessment. Participants were interviewed by the researcher who introduced herself and explained the aim of the study briefly seeking their agreement in the study and reassuring them that the information obtained was strictly confidential and would not be used for any purposes other than research. The researcher read and explained each item of the study scales to the elderly and then recorded their response to each item. The time consumed for filling the study tools ranged from 25 to 30 minutes. The data were preliminary analyzed to provide the basis for building up the intervention according to identified needs.

Planning phase:

In light of the results of the data analysis conducted during the assessment phase, and in view of the relevant literature about elderly with mild cognitive impairment, as well as according to the needs of the studied elderly and the study's goals, the researcher created the educational program and session's content.

Implementation phase:

The program was implemented in the study setting in the form of six sessions for small groups. This was carried out to increase the opportunities for discussions, interactions. The total sample was divided into small groups (2 to 4 elderly in each group). The same teaching strategies, materials, discussions, and booklet were used with all groups to provide the identical contents. The rate of two sessions per month. The length of each session was variable (30 to 45) minutes according to elderly's responses and active participation, as well as the time available, and the content of each session. The fieldwork was executed over a period of ten months, starting from the beginning of November 2022 up to the end of August 2023. The researcher allocated three days weekly (Saturday, Monday, and Wednesday) from 3.00 pm to 6.00 pm. This included the phases of assessment, planning, implementation, and evaluation of the program. Each session began with a summary of the information presented in the previous session and the goals of the new one, taking into account the use of straightforward language that suited the understanding level of the studied elderly. During the session, motivational and reinforcement strategies like praise and acknowledgment were utilised to increase active involvement and promote learning. In addition to the booklet, the sessions were supported by the use of images, posters, and power point.

Evaluation phase:

The evaluation of the effectiveness of the educational program (posttest) was done just after completion the program. These were done using the same data collection tools of the pre-test.

Ethical Considerations

The study proposal was approved by the Research Ethics Committee (REC) and the Postgraduate Committee of the Faculty of Nursing at Zagazig University, Egypt. An informed consent for participation was taken verbally from each of the elderly subjects after a full explanation of the aim of the study. Participants were given the opportunity to refuse participation, and they were notified that they could withdraw at any stage of the data collection interviews; also, they were assured that the information would be confidential and used for research purposes only. The researcher assured maintaining the anonymity and confidentiality of the subjects' data. The researcher's phone number and all possible communication methods were identified to the participants to return at any time for any explanation.

Statistical *analysis*

Statistical analysis was conducted using Statistical Package for Social Sciences (SPSS) version 22. The descriptive analyses were expressed as frequencies, percentages, means, and standard deviations (SDs). Percentages of categorical variables were compared using the Chi-square test. Independent t-test was used to compare the means of the study variables between the study and control groups, and paired t-test was used to compare the means of the study variables pre and post the intervention in each group. In order to identify the correlation between the main study variables, Pearson's correlation coefficient was used. In order to identify the independent predictors of the main study variables, the multiple linear regression analysis was used, and analysis of variance for the full regression models was done. Cronbach alpha coefficient was calculated to assess the reliability of the study tools through their internal consistency. Significance of the results: Highly significant at p-value < 0.01, statistically significant was considered at p-value < 0.05, non-significant at p-value ≥ 0.05.

3. Results

Older population characteristics in the intervention and control groups

Considering the demographic characteristics of studied elderly in the study and control groups table 1 revealed that 65.0 % of the of study group elderly aged 60-65 years, and the mean age of them was 64.80±5.35 years, 82.5% of them did not work and 90.0% of them were living with family. Meanwhile, 42.5% of the control group were aged between 60 – 65 with mean age of 67.47±4.84, 62.5% of them were female, 90.0% of them did not work, 97.5% of them were living with the family. Referring to medical history table 2 the highest percentages of the studied elderly in both study and control group**s** have chronic diseases (85.0 %), were taking medications (77.5 %) and (65 %) respectively.

Referring to mini- mental state test pre-post-intervention among the study and control groups

Table 3 reveals that there were no significant differences in MMSE score between the two groups in the pretest. There was significant improvement in the total mean score of mini-mental state test in the study group (93.53±3.85) post intervention. On the other hand, there was no significant improvement in it among control group post intervention. This means that there was statistically significant between the study and control groups in the total mean score of mini- mental state test post-the program.

The MCI knowledge pre and post program among the study and control groups.

Figure 1 portrays that there was high statistically improvement in MCI knowledge level among the studied elderly post-intervention with high satisfaction level (80%) compared to the control group that had no significant improvement in the total level of MCI knowledge with low satisfaction level (37.50).

Correlations between MCI knowledge and MMSE score post-intervention in the study group

The study results indicated that total MMSE score was positively correlated to MCI knowledge score (r = 0.750) (Table 4).

Predictors of MMSE score among the study group

Table 5 indicates that there were statistically significant relations between the study group high total mean score of mini- mental state test and aging between 60– 65 years old, being male, high educational level, living with the family and high income. On the other hand, the elderly who have chronic diseases, smoker ad have family history of cognitive impairment were associated with low mini mental scale test score.

4. Discussion

The existing study results clarified that before the training program, the elderly in both study and control groups with mild cognitive impairment has low score of MMSE. This might be attributed to low medical services status that makes access to health information difficult to accomplish. They also had limited awareness regarding MCI and the importance of early detection, management and prevention of MCI especially at ruler area. In the same stream, a study conducted in China by Liu et al. [8] found that the prevalence of MCI in rural areas was twice that in urban areas and there is association between rural socioeconomic and lifestyle disadvantage and MCI. In addition, a study conducted in Thailand by [9] found that the prevalence of MCI in older Thai people in a rural area is high compared with that in other countries [8]. After the implementation of the current study intervention, the existing study results indicated that there were statistically significant improvements in the total mean score of mini- mental state test in the study group (93.53±3.85). This might be attributed to the content of the intervention program, which focused on improving the cognitive functions, mental skills and also be sure that the hand exercises are applied by easy and attractive maneuver.

Table 1: Demographic characteristics of the studied elderly in the study and control groups (n=80).

Demographic characteristics	Study group (n=40)		Control group (n=40)		X^2 (P-value)
	No.	%	No.	%	
Age group: /year					FET (0.072)
60-65	26	65.0	17	42.5	
> 65	14	35.0	23	57.5	
Mean ± SD	64.80±5.35		67.47±4.84		t=-2.345 p=0.32
Gender:					FET (0.820)
Male	17	42.5	15	37.5	
Female	23	57.5	25	62.5	
Marital status:					FET (0.173)
Married	27	67.5	20	50.0	
Unmarried	13	32.5	20	50.0	
Educational level:					6.516 (0.164)
illiterate	6	15.0	14	35.0	
Read &write	6	15.0	5	12.5	
Basic education	3	7.5	5	12.5	
secondary education	9	22.5	8	20.0	
University education	16	40.0	8	20.0	
Previous working:	21	52.5	13	32.5	4.067 (0.254)
Employee	3	7.5	5	12.5	
Worker	3	7.5	2	5.0	
Farmer	13	32.5	20	50.0	
Housewife					
Current occupation:	33	82.5	36	90.0	FET (0.518)
Does not work	7	17.5	4	10.0	
Works					
Living with whom:	36	90.0	39	97.5	FET (0.359)
With the family	4	10.0	1	2.5	
On my own	0	0.0	0	0.0	
Others					
Monthly income	25	62.5	22	55.0	1.058 (0.589)
sufficient	13	32.5	17	42.5	
insufficient	2	5.0	1	2.5	
sufficient and abundant					
Source of income:	35	87.5	37	92.5	2.722 (0.436)
Pension	2	5.0	1	2.5	
Helping children	2	5.0	2	5.0	
Renting property	1	2.5	37	92.5	
Ministry of Solidarity and SocialJustic					

χ 2 : Chi square test, FET: Fisher exact test, t: student t-test, non-significant(p>0.05

Table 2: Medical history of the studied elderly in the study and control groups (n=80)

Items	Study group (n=40)		Control group (n=401)		X^2 (P-value)
	No.	%	No.	%	
chronic diseases:					
Yes	34	85.0	34	85.0	FET (0.99)
No	6	15.0	6	15.0	
If yes, types of the chronic diseases					
Hypertension	13	32.5	17	42.5	FET (0.489)
Diabetes mellitus	14	35.0	12	30.0	FET (0.812)
Respiratory diseases	1	2.5	3	7.5	FET (0.615)
Heart diseases	5	12.5	9	22.5	FET (0.378)
Liver diseases	6	15.0	4	10.0	FET (0.737)
GIT diseases	6	15.0	4	10.0	FET (0.737)
kidneys and urinary tract diseases	2	5.0	4	10.0	FET (0.675)
Taking medication:					
Yes	31	77.5	26	65.0	FET (0.323)
No	9	22.5	14	35.0	
If yes, types of the medications:					
Medicines that lower blood pressure	16	40.0	19	47.5	FET (0.652)
Medicines to treat diabetes	15	37.5	13	32.5	FET (0.815)
Medicines to regulate the heartbeat	5	12.5	7	17.5	FET (0.755)
Antidepressants	3	7.5	1	2.5	FET (0.99)
Medicines used to treat anxiety disorders	2	5	1	2.5	FET (0.99)
No. of medicines per day:					
zero	5	12.5	5	12.5	0.850 (0.654)
<5	30	75.0	27	67.5	
5-10	5	12.5	8	20.0	
Smoking					
Currently	2	5.0	1	2.5	7.817 (0.051)
Previously	9	22.5	10	25.0	
No	27	67.5	20	50.0	
Passive Smoker	2	5.0	9	22.5	
Family history of cognitive impairment					
Yes	17	42.5	16	40.0	FET (0.99)
No	23	57.5	24	60.0	
If the answer is yes, What is kinship					
First degree	13	76.5	13	81.25	FET (0.99)
Second degree	4	23.5	3	18.75	

χ 2 : Chi square test , FET: Fisher exact test, non-significant(p>0.05)

Table (3): Total mean score of mini- mental state test pre-post-intervention in the study and control groups (n=80).

	pre		*t-test* (P-value)	Post		*t-test* (P-value)
	Study group (n=40)	Control group (n=40)		Study group (n=40)	Control group (n=40)	
	Mean± SD			Mean± SD		
Cognitive impairment score	78.23±2.85	77.68±1.07	1.1427 (0.2567)	93.53±3.85	78.53±2.31	21.129(<0.001**)

non-significant(p>0.05), **: statistically highly significant (p<0.01).

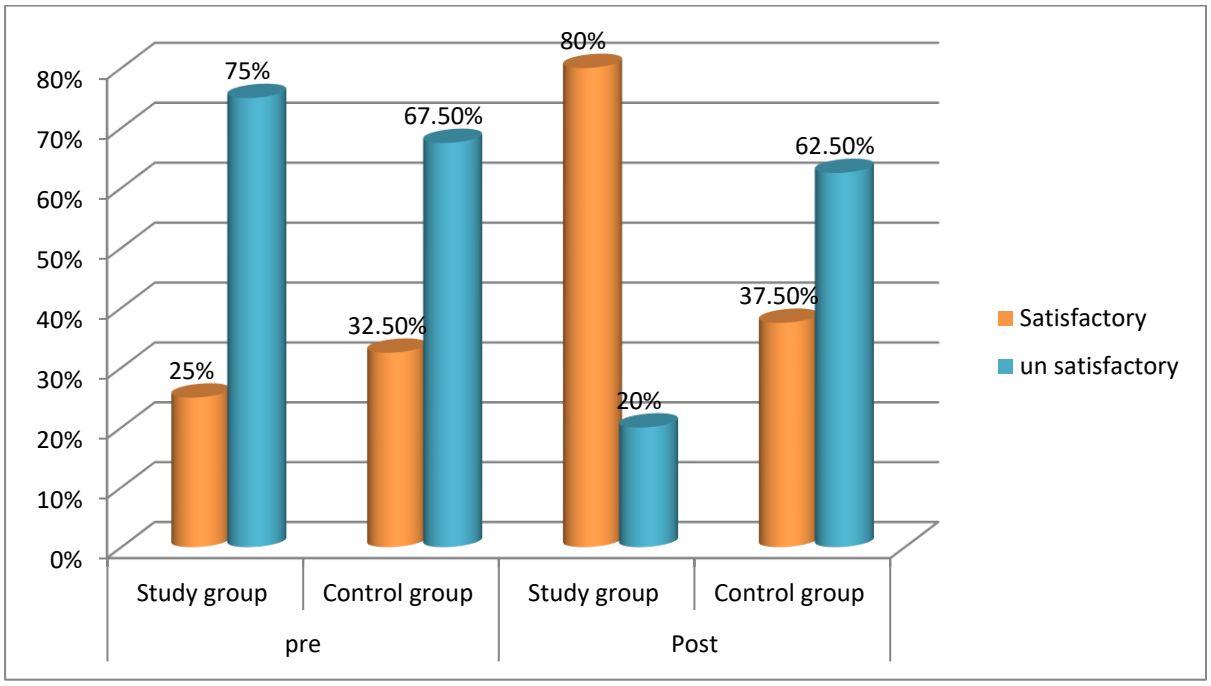

Figure (1): Bar chart showing total level of MCI knowledge among the studied and control groups pre and post intervention

Table 4: Correlation matrix between study variables post intervention.

Items	MMST	MCI knowledge	hand exercises knowledge	Hand exercises practice
Mild cognitive impairment (r) MMST				
Cognitive knowledge (r)	0 .750**			

r: correlation coefficient, **: statistically highly significant (p<0.01)

Table (5): Best fitting multiple linear regression for predicting factors which affect MMST

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	75.516	.522		144.686	.000	74.476	76.555
Intervention program	-0.770	0.051	-0.764	-15.047	<0.001**	-0.872	-0.668
Education	-0.969	0.150	-0.328	-6.454	<0.001**	1.268	-0.670
Aging	-.448-	.184	-.265-	-2.429-	0.017*	-.814	-.081-
Gender (female)	-.823-	2.031	-.046-	-2.405-	0.045*	-4.867	3.221
living with whom (with the family)	3.587	4.095	.099	3.876	0.038*	4.566	11.740
chronic diseases	1.083	2.787	.044	4.389	0.032*	4.465	6.632

**: statistically highly significant (p<0.01). R-square=0.816, ANOVA: F= 168.630, P<0.001

Regarding to MCI knowledge, the existing study results clarified that more than three-quarters of the elderly in both study and control groups had unsatisfactory MCI knowledge before the intervention. Possible explanation of such results may be related to a lack of health information acquisition and lack of the culture of early detection of MCI at ruler areas. In the same line, a study conducted in China by [12] demonstrate that there was lack of knowledge regarding MCI among the participants. Another study conducted in China by [11] approved that the total mean score of knowledge regarding MCI was 50.05 ± 19.80 that makes a barrier against the management of MCI. Referring to the post-intervention MCI knowledge in the study and control groups, the existing study results indicated that there was high statistically significant improvement in MCI knowledge level among the studied elderly post-intervention with high satisfaction level (80%) compared to the control group that had no statistically significant improvement. This might be attributed to the effect of the intervention which focused on equipping elderly with knowledge about MCI, management of its signs, diet, and exercises. These findings are consistent with a study conducted in Florida by [12] who reported that the experimental group satisfaction of MCI knowledge increasing to 79% after the intervention. Likely, Liu et al. who conducted a study in China clarified that there was significant improvement of the level of knowledge of MCI after the intervention program [13]. Referring to predictors of MMSE score among the study group, the study findings exposed that the increased age was associated and a common independent negative predictor for the total MMSE score. A concordant study conducted in Austria by [14] demonstrated that increasing age is reflected by lower mini-mental state examination. Also, [15] in Canada explained that aging-associated with cognitive decline.

Additionally, the study findings demonstrated that being female was independent negative predictor for the total MMSE score. In the same line, study conducted in China by [11] demonstrated that the prevalence of MCI was higher in the population of elderly women compared to men. In contrast, a study conducted in Malaysia by [16] after 1½-year follow-up, the incidence rate for MCI was considerably high among the respondents. Being male was predictor of the occurrence of MCI. Additionally, a study conducted in Taiwan by [17] suggests that chronic diseases and increased age contribute to different neurodegenerative processes in MCI. The study shows that there were statistically significant relations between the study group total mean difference score of mini- mental state test and their educational level, living with whom. As well, a study conducted in Sweden by [18] concluded that higher educational level and more years of education were associated with lower risk of incident MCI. In the same line, a study conducted in Brazil by [19] concluded that higher education decreased this risk of MCI.. Similarly, study conducted in Pakistan by [20] approved the relationship between loneliness of the elderly with MCI.

Accordingly, the study result demonstrated that there were statistically significant relations between the study group' total mean difference score of MMSE, chronic diseases and smoking. Similarly, a study conducted in China by [19] demonstrate that the pooled estimated prevalence of mild cognitive impairment in chronic diseases elderly is high worldwide, especially in China Asia. Another study conducted in China by [21] found that MCI predictors including rural residence, lower education, living alone, smoking and chronic diseases. Additionally, a study conducted in Italy by [21] confirmed that chronic diseases contribute to a higher risk of Mild cognitive impairment. Considering the correlation between the study variables, the study findings clarified that there was a significant positive correlation between MMSE and MCI knowledge. This might be attributed that the elderly with high score of MMST have more ability to learn and gain knowledge that is the basis and reflection for any practice and any healthy behavior is often based on correct knowledge. In the same vein with the study group results, a study conducted in Canada by [9] demonstrated that high score of MMSE associated with high score of MCI knowledge as they found that there were significant differences in the level of MMSE after the intervention.

5. Conclusions

The study findings were concluded that pre the educational program, the elderly with mild cognitive impairment in either the study or control group had low score of MMSE and inadequate knowledge regarding MCI knowledge. Meanwhile, after the intervention, the study group had significant improvements regarding their MMSE score, knowledge regarding MCI, Ultimately, it was proved that the educational program is effective in the improvement of mild cognitive impairment among older population.

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Declaration of Conflicting Interests

The Author(s) declares(s) that there is no conflict of interest.

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