Effect of Health Literacy Intervention on Dietary and Exercise Knowledge and Practice among Older Adults with Chronic Diseases

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Abstract: **Older adults often have a greater need for health information about diet and exercise and health care services that help them to manage their health. Aim: Examine the effect of health literacy intervention on dietary and exercise knowledge and practice among older adults with chronic diseases (diabetes and hypertension). Design: A quasi-experimental (study and control design). Settings: Family health unit in Dragel village, Menoufia Governorate, Egypt. Sample: A purposive sample of 140 older adults. Data collection tool: Interviewing questionnaire with five parts: Socio-demographic data, medical history, dietary knowledge and practice for diabetes and hypertension, knowledge and practice of exercise for diabetes mellitus and hypertension, and physiological measurement of random blood glucose and blood pressure. Results: Three months after the intervention, there was a significant improvement in the dietary and exercise knowledge and practice of the study group compared to pre-intervention and the control group. Also, there was a significant control in mean random blood glucose level and blood pressure of the study group compared to pre-intervention and the control group, which indicate the effectiveness of health literacy intervention. Conclusion: The health literacy intervention was effective in improving dietary and exercise knowledge and practice for diabetes and hypertension as well as significant control in random blood glucose and blood pressure among older adults. Recommendations: Health care providers especially nurses should provide regular health education and follow up for dietary and exercise practices for older adults with chronic diseases.**

Keywords: **Health literacy - Older Adults - Chronic diseases.**

1. INTRODUCTION

Aging is associated with a variety of body changes that lead to glucose intolerance and changes in blood vessels that increased the risk of diabetes and hypertension. Diabetes and hypertension are associated with physical impairment, multiple comorbidities, and premature mortality among the older adult population (Löhr et al., 2018; Sesti et al., 2018). thus, lifestyle modifications through nutrition and exercise in combination with medications are the key components of diabetes and hypertension management (Abdelhafiz& Sinclair, 2015).

Nutrition is essential to the proper management of diabetes and hypertension. The health care providers must develop and adopt various strategies to address some of the common nutritional, lifestyle, and self-management barriers that older adults face (Stanley, 2014). Nutrition assessments of older adults with diabetes and hypertension should be

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comprehensive, with attention to each patient's nutritional requirements, and constructing a realistic nutrition care plan is essential for management (Sesti et al., 2018). The maintenance of regular exercise is essential for controlling blood glucose and blood pressure as well as the overall health of individuals with diabetes and hypertension. The exercise recommendations and precautions vary depending on individual characteristics and health status and should be adapted to meet each need (Colberg et al., 2016).

Appropriate food choices and practice of exercise should be considered essential for ensuring the maintenance of good health. Healthy nutrition also promotes quality of life, reduces the frequency of hospitalization and the cost of the treatment (Campbell, 2017). It is widely accepted that healthy nutrition and exercise are the basis for the treatment of type II diabetes and hypertension. It contributes positively to the maintenance of blood glucose and blood pressure within the normal range, minimizes the complications of the disease, reduces cardiovascular risk factors, maintenance of healthy weight, and improves well-being(Abdelhafiz& Sinclair, 2015).

Health literacy (HL) is defined as the ability to obtain, process, and understand basic health information and services needed to manage one's health and make appropriate health decisions. Health literacy encompasses various skills needed to direct the healthcare system, including print literacy and oral literacy (speaking/listening effectively) (Centers for Disease Control and Prevention, 2015). Individuals with inadequate HL may have suffered from even basic health-related tasks, such as following prescribed instructions, calculating dosages, communicating with providers, and struggle to self-manage multiple conditions and coordinate their care (MacLeod et al., 2017).

Self-management–based interventions can lead to improved health outcomes in people with chronic diseases as well as patient behavior that help to develop proper self-management behavior (Mackey et al., 2016). Self-management skills are an essential part of diabetes and hypertension management and with the help and support of the nurse, the condition can be managed to help older people stay healthy and prevent complications (Boström et al., 2014).

The nurse is in an essential position to provide good patient care and promoting self-care management by increasing the provision and uptake of diabetes and hypertension self-management education (Houweling et al., 2011). The nurse can help the patients to make lifestyle changes to control disease, maintain a balanced diet, healthy weight, and regular physical exercise (Munshi et al.,2016); therefore this study was conducted to examine the effect of health literacy intervention on dietary and exercise knowledge and practice among older adults with chronic diseases (diabetes and hypertension).

AIM OF THE STUDY:

Examine the effect of health literacy intervention on dietary and exercise knowledge and practice among older adults with chronic diseases (diabetes and hypertension).

RESEARCH HYPOTHESIS

1. Older adults who will receive health literacy intervention will have better knowledge about diet and exercise-related to diabetes and hypertension than older adults who will not receive health literacy intervention.

2. Older adults who will receive health literacy intervention will have controlled random blood glucose levels and blood pressure than older adults who will not receive health literacy intervention.

2. METHODS

2.1 Design: A quasi-experimental (study and control design).

2.2 Settings: Family health unit in Dragel village, Menoufia Governorate, Egypt that was selected using multi-stage random selection.

2.3 Sample: A purposive sample of 140 older adults was divided randomly into two equal-matched groups (study and control group) by using simple random selection.

2.3.1 Inclusion criteria: Older adults 60 years and older with diabetes mellitus and/ or hypertension.

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2.3.2 Sample size and power of the study:

The sample size was calculated based on power analysis performed by Kelsey, Fleiss, and Fleiss (2010) which indicated that; 140 older adults would yield sufficient power of 80% to detect the effect of health literacy intervention on older adults with chronic diseases, based on the following assumptions: Effect size= 0.5, and alpha=0.05, the power of 80 % and the ratio of exposed to risk factors to those who were not exposed =1:1.

2.4 Data collection instrument:

Interviewing questionnaire with five parts. Part 1:Socio-demographic data such as name, age, sex, etc. Part 2: Medical history, type of disease affected, etc. Part 3: Dietary knowledge and practice related to diabetes mellitus and hypertension. The total score of the dietary knowledge scale was ranged from 0 to 6 that categorized into 0-3 poor knowledge 4-6 good knowledge. Also, the total score of the dietary practice scale was ranged from 0 to 24 that categorized into 0-12 unhealthy practice13-24 healthy practice. Part 4: Knowledge and practice of physical exercise-related to diabetes mellitus and hypertension. The total score of the exercise knowledge scale was ranged from 0 to 6 that categorized into 0-3 poor knowledge 4-6 good knowledge. Also, the total score of the exercise practice scale was ranged from 0 to 6 that categorized into 0-3 improper practice 4-6 proper practice. Part 5: Physiological measurement of random blood glucose and blood pressure. The decision for controlled blood glucose was interpreted according to American Diabetes Association (2019) as 70 to 130 mg/dl (fasting blood glucose), less than 180 mg/dl one to two hours after a meal, random blood glucose less than 200 mg/dl and HbA1c level of 7 percent or less. These standards are the same for men and women. The decision for controlled blood pressure was interpreted according to American Diabetes Association (2019) as a blood pressure of less than 140/80. This standard is the same for men and women. The reliability of the instrument was estimated using the test-retest method on 14 participants. The Cronbach alpha coefficient was 0.85 which indicates that the instrument is reliable.

2.4.2 Validity of the instrument: The instrument was tested for validity by a jury of five experts in the field of Community Health Nursing and Geriatric Nursing, to ascertain the relevance, completeness, clarity, fluency, and simplicity of each component in the instruments.

2.5 Pilot Study: A pilot study was carried out on 14 older adults to assess the clarity, feasibility, applicability of the study instruments, and the time needed to fill the required data. The data of the pilot study was used to estimate the reliability of the instrument. The participants of the pilot study were not included in the study sample.

2.6   Ethical Consideration:

• The protocol of this study was revised and approved by the Ethical Research Committee of the Faculty of Nursing, Menoufia University.

• An official letter was obtained from the dean of the Faculty of Nursing, Menoufia University to the director of the family health unit at Dragel to collect data and gain their help during the study period.

• Verbal informed consent from each participant was obtained after explaining the purpose and duration of the study as well as they assured that their data will be used for research purpose only.

2.7 Data collection procedure:

The data collection for this study was conducted in 4 phases

Phase one: Preparation of data collection instruments.

Phase two: Obtaining verbal consent, explaining the purpose of the study to participants, and collecting pre-intervention data for the study group and first assessment for the control group. The filling of the instruments took about 20- 30 minutes for each participant; then the measurements of blood glucose and blood pressure were taken.

Phase three: The sample of the study was randomly divided into two equally matched groups (study and control group). The control group was received routine care and the study group was received health literacy intervention. The intervention was carried out in three sessions each session was taken 20- 30 minutes using small group teaching (2-5 participants). The first session included information about diabetes mellitus and hypertension disease; the second session

related to diet regimen for diabetes and hypertension; the third session related to exercise regimen for diabetes and hypertension. By the end of the third session, the study group received a hard copy of the health literacy intervention.

Phase four: Posttest about dietary and exercise knowledge was administered for the study group immediately and 3 months after the intervention. The data of three months post-intervention was collected for the study group and second assessment of the control group regarding dietary and exercise knowledge and practice; regarding physiological measurements, the random blood glucose and blood pressure were measured monthly post-intervention for three months for both study and control groups and the mean of three measures were be taken for comparison. By the end of three months, post-intervention the participants of the control group were received a hard copy of the intervention program.

Data collection period: Data were collected during the period from the beginning of January 2020 to the end of October 2020.

2.8 Statistical analysis:

The collected data were organized, coded entered to computer, and statistically analyzed using SPSS version 22 (Statistical Package for Social Studies). The quantitative data presented in the form of a number, percent, mean and standard deviation. Categorical variables were tested using the Chi-squared test. Comparison between the means of two dependent groups using paired t-test. The likelihood-ratio test (LR) is used to assess the goodness of fit of two competing statistical models based on the ratio of their likelihoods. The level of significance was adopted at $p<0.05$.

3. RESULTS

Table1 shows that 72.9% of the study group was in the age group 60-70 years, 64.3% were females, 58.6% were married, 37.1% do not read or write, 75.7% were not working and 57.1% with not enough income. While 67.1% of the control group was in the age group 60-70 years, 55.9% were females, 62.8% were married, 37.1% do not read or write, 64.3% were not working and 61.4% with not enough income; there were no significant differences between the study and control group regarding all sociodemographic characteristics.

Table 2 demonstrates that, there were significant differences between the study and the control group for most items of history except for the number of medications and doses prescribed for diabetes.

Table 3 reveals that the immediate and three months post-intervention mean total score and degree of knowledge about nutrition among the study group were significantly improved compared to their pre-intervention mean score and degree of knowledge; as well as the first and second assessment of the control group.

Table 4 shows that the immediate and three months post-intervention mean total score and degree of knowledge about exercise among the study group were significantly improved compared to their pre-intervention mean score and degree of knowledge; as well as the first and second assessment of the control group.

Table 5 represents that, three months post-intervention degree and mean total score of dietary practice levels among study group were significantly improved compared to their pre-intervention degree and mean total score; as well as the first and second assessment of the control group.

Table 6 illustrates that, three months post-intervention degree and mean total score of exercise practice levels among the study group were significantly improved compared to their pre-intervention degree and mean total score; as well as the first and second assessment of the control group. The findings of tables 3-6 provide support to the first research hypothesis.

Table7 demonstrates that the mean random blood glucose of three follow up measures post-intervention was significantly controlled in older adults with healthy dietary practice among the study group compared to their mean random blood glucose in pre-intervention; as well as the mean of random blood glucose in the first and second assessment of the control group.

Table 8 shows that the mean systolic and diastolic blood pressure of three follow up measures post-intervention was significantly controlled in older adults with healthy dietary practice among the study group compared to their mean systolic and diastolic blood pressure in pre-intervention; as well as the mean systolic and diastolic blood pressure in the first and second assessment of the control group. The findings of table 7,8 provide support to the second research hypothesis.

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Table 1: Sociodemographic characteristics of study and control groups

Sociodemographic characteristics		Study group		Control group		X^2	P
		N0.	%	N0.	%		
Age groups	60 – 70 yeas	51	72.9	47	67.1	0.54	0.4 NS
	70 -80 years	19	27.1	23	32.9		
Gender	Male	25	35.7	31	44.1	1.1	0.3 NS
	Female	45	64.3	39	55.9		
Marital status	Married	41	58.6	44	62.8	LR=1.4	0.4 NS
	Widow	24	43.3	24	34.3		
	Divorced/single	5	7.1	2	2.9		
Education	Not R & W	26	37.1	26	37.1	2.3	0.5 NS
	Basic education	15	21.4	16	22.9		
	Secondary education	20	28.6	24	34.3		
	University	9	12.9	4	5.7		
Job	Not work	53	75.7	45	64.3	2.2	0.14 NS
	Free business	17	24.3	25	35.7		
Income	Nor enough	40	57.1	43	61.4	LR=0.57	0.7 NS
	Enough	27	38.6	23	32.9		
	> Enough	3	4.3	4	5.7		
Total		70	100	70	100		

*LR = The likelihood-ratio

Table 2: Past history of diseases suffered by the study and control groups pre and post-intervention

History of diseases suffered	Study group Pre-intervention		Control group first assessment		P_{re}
	No	%	No	%	
Current suffered diseases:					
DM	12	17.1	23	32.9	χ^2=6.2, P=0.05
Hypertension	19	27.2	21	30	
Both DM& hypertension	39	55.7	26	37.1	
Mean duration of DM	7.0 ± 2.3 Y		6.3±1.7Y		t=0.7,p=0.5
Mean duration of hypertension	8.7±3.6 Y		6.3±4.1 Y		t=2.1,p=0.03
Taking the medicine regularly:					
No	15	21.4	10	14.3	χ^2=6.2, P=0.05
To some extent	37	52.9	35	50	
Yes	18	25.7	25	35.7	
The number of medications prescribed to treat diabetes mellitus					
No drug	18	25.8	21	30	χ^2=0.32, P=0.85
One drug	33	47.1	31	44.3	
Two drugs	19	27.1	18	25.7	
The number of medications prescribed to treat hypertension					
No drug	12	17.1	23	32.9	χ^2=6.4, P=0.04
One drug	26	37.1	15	21.4	
Two drugs	32	45.8	32	45.7	

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The number of daily doses of medication for the treatment of diabetes					
No dose	18	25.7	21	30	
One dose	20	28.6	19	27.1	LR=0.56, P=0.91
Two doses	29	41.4	26	37.1	
Three doses or more	3	4.3	4	5.7	
The number of daily doses of medication for the treatment of hypertension					
No dose	12	17.1	23	32.8	
One dose	22	31.5	13	18.6	LR=10.0, P=0.01
Two doses	33	47.1	34	48.6	
Three doses or more	3	4.3	0	0	
Total	70	100	70	100	

*LR = The likelihood-ratioP1= Comparison between study and control group pre-intervention.

Table 3: Nutrition knowledge levels among the study and control groups pre, first post-intervention, and second post-intervention

Degree of knowledge about nutrition	Study group Pre-intervention		Control group first assessment		P_{re}	Study group immediate post-intervention		Study group 3 months post-intervention		Control group second assessment after 3 months		P_{post1}	P_{post2}
	No	%	No	%		No	%	No	%	No	%		
Poor knowledge (0-3)	42	60	45	64.3	χ^2=0.27 P=0.60	2	2.9	6	8.6	53	75.7	χ^2=55.1 P<0.0001	χ^2=64.7 P<0.0001
Good knowledge (4-6)	28	40	25	35.7		68	97.1	64	91.4	17	24.3		
Mean total score of nutrition knowledge.	2.9±0.9		2.7±0.9		t=0.64, P=0.51	5.6±0.7		5.2±1.0		2.6±1.4		t=12.8, P<0.0001	t=11.7, P<0.0001

P pre = Comparison between study and control group pre-intervention. P1= Comparison among study group post-intervention. P2= Comparison between study and control group three months post-intervention.

Table 4: Comparison between the study and control groups regarding exercise knowledge pre, first post-intervention, and second post-intervention

Degree of knowledge about exercise	Study group Pre-intervention		Control group first assessment		P_{re}	Study group immediate post-intervention		Study group 3 months post-intervention		Control group second assessment after 3 months		P_{post1}	P_{post2}
	No	%	No	%		No	%	No	%	No	%		
Poor knowledge (0-3)	57	81.4	63	90	χ^2=2.1 P=0.15	0	0	6	8.6	53	75.7	χ^2=99 P<0.0001	χ^2=67.2 P<0.0001
Good knowledge (4-6)	13	18.6	7	10		70	100	64	91.4	17	24.3		
Mean total score of exercise knowledge	1.9±0.8		1.7±0.8		t=1.1, P=0.25	5.6±0.6		5.1±1.2		2.1±0.2		t=17.1, P<0.0001	t=11.3, P<0.0001

P pre= Comparison between study and control group pre-intervention. P1= Comparison among study group post-intervention.P2= Comparison between study and control group three months post-intervention.

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Table 5: Comparison between the study and control groups regarding diet practice pre, post-intervention

Degree of nutrition practice	Study group Pre-intervention		Control group first assessment		P_{re}	Study group 3 months post-intervention		Control group second assessment after 3 months		P_{ost}
	No	%	No	%		No	%	No	%	
Unhealthy practice (0-12)	43	61.4	48	68.6	χ^2=1.1, P=0.31	8	11.4	57	81.4	χ^2=81.6 P<0.0001
Healthy practice (13-24)	27	38.6	22	31.4		62	88.6	13	18.6	
Mean total score of nutrition practice	10.7±4.2		12.6±4.6		t=2.3, P=0.02	19.6±3.4		9.4±3.3		t=16.3, P<0.0001

Table 6: Comparison between the study and control groups regarding exercise practice pre, post-intervention

Degree of exercise practice	Study group Pre-intervention		Control group first assessment		P_{re}	Study group 3 months post-intervention		Control group second assessment after 3 months		P_{ost}
	No	%	No	%		No	%	No	%	
Improper practice (0-3)	57	81.4	61	87.1	χ^2=0.86 P=0.35	16	22.9	62	88.6	χ^2=61.3 P<0.0001
proper practice (4-6)	13	18.6	9	12.9		54	77.1	8	11.4	
Mean total score of exercise practice	2.0 ±0.7		1.6 ±0.9		t=1.7 p=0.08	4.7 ±1.5		1.7 ±0.8		t=12.1, P<0.0001

Table 7: Relation between dietary practice levels of older adults and mean blood glucose in three follow up measures post-intervention among the study and control groups

3 months Post-intervention dietary practice degree	Mean of three measure random blood glucose				P-value
	Study group		Control group		
	N	Mean± SD	N	Mean± SD	
Unhealthy practice (10-12)	8	180.3±34.3	57	182.5±27.4	t=1.8 p=0.07
Healthy practice (13-24)	62	144.7±25.8	13	185.8±36.3	t=52.4 p<0.0001

Table 8: Relation between post dietary practice levels of older adults and mean systolic and diastolic blood pressure in three follow-up measures post-intervention among the study and control groups.

3 months Post-intervention dietary practice degree	Mean of three measure systolic blood pressure				P-value	Mean of three measure diastolic blood pressure				P-value
	Study group		Control group			Study group		Control group		
	N	Mean± SD	N	Mean± SD		N	Mean± SD	N	Mean± SD	
Unhealthy Pr. (10-12)	8	132.5±5.0	57	135.3±11.8	t=1.6 p=0.09	8	90.0±0.0	57	88.2±8	t=1.8 p=0.07
Healthy pr. (13-24)	62	118.1±15.7	13	128.5±13.4	t=5.7 p<0.0001	62	77.6±5.5	13	83.8 ±10.4	t=2.2 p<0.03

4.   DISCUSSION

Chronic disease management especially diabetes and hypertension through dietary control and performance of proper exercise lead to delay or prevent the onset of disease complications, so it hinders disease progression (Alzaheb & Altemani, 2018). Therefore, the purpose of this study was to examine the effect of health literacy intervention on dietary and exercise knowledge and practice among older adults with chronic diseases (diabetes and hypertension).

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Frist hypothesis assumed that older adults who will receive health literacy intervention will have better knowledge about diet and exercise for diabetes and hypertension than older adults who will not receive health literacy intervention. The findings of this study provide support to this hypothesis as shown from the results the immediate and three months post-intervention knowledge about nutrition and exercise among the study group were significantly improved compared to their pre-intervention knowledge and first and second assessment of the control group. Also, three months post-intervention dietary and exercise practice levels among the study group were significantly improved compared to their pre-intervention practice and first and second assessment of the control group. These results were consistent with Uemura et al., (2020), they found that an active learning program for promoting a healthy lifestyle had a significant improvement in health literacy, engagement in moderate-to-vigorous physical activity, and taken healthy diet in the study group compared to the control group among Japanese older adults with low health literacy.

Also, the present study results were in accordance with Oyewole et al., (2020), they found that a training program on knowledge and practice of dietary and exercise modification had a significant improvement in knowledge level and practice about diet and exercise in post-intervention than pre-intervention among hypertensive older patients in Nigeria. Moreover, the current study results came in agreement with Friedberg et al.(2015), who reported that a tailored behavioral intervention had a significant improvement in knowledge and practice about diet and exercise in the intervention group compared to the control group with usual care among older adults in New York.

The second hypothesis assumed that older adults who will receive health literacy intervention will have controlled blood glucose levels and blood pressure than older adults who will not receive health literacy intervention. The findings of the current study provide support to this hypothesis as revealed in significant control in three follow-up measures post-intervention of random blood glucose and systolic and diastolic blood pressure among the study group compared to their pre-intervention and first and second assessment of the control group. Similar findings were reported by Zullig et al., (2014), who found that at six months post health literacy intervention average systolic blood pressure was decreased 0.5 mmHg and diastolic blood pressure was decreased by 1.5 mmHg compared to pre-intervention among American patients' at primary care clinics. Also, the current findings were consistent with Lee et al., (2017); they found that a significant improvement in post-intervention blood glucose level among the study group as they concluded that the health literacy intervention helpful in improving blood glucose level among older adults in South Korea. While, the current study findings were in contradiction with Trinidad (2020), who reported that the educational intervention on health literacy and medication adherence had no statistically significant effect on blood glucose control among older Hispanic women with type II diabetes mellitus this contradiction might be due to difference in culture and lifestyle practice.

5. CONCLUSION

The health literacy intervention was effective in improving dietary and exercise knowledge and practice for diabetes and hypertension; as well as significant control in random blood glucose and blood pressure among older adults in the study group compared to the control group.

6. RECOMMENDATION

Health care providers especially nurses should provide regular health education and follow up for dietary and exercise practices for older adults with diabetes and hypertension.

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