

Effect of Health Promoting Behaviors Intervention on Elderly Diabetics at Abu Kabir Central Hospital

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Abstract

Background: Diabetes is a fast-growing health problem in Egypt with a significant impact on morbidity, mortality, and health care resources. Health promoting behaviors is positively associated with diabetic control among elderly diabetics; this study indicated that practicing health-promoting behaviors led to better control of diabetes.

The aim of this study was to evaluate the effect of health promoting behaviors intervention on elderly diabetics at Abu Kabir central hospital.

Research design: A quasi-experimental design was used to conduct this study. **Setting:** The study was conducted at Abu Kabir central hospital's outpatient internal clinic. **Subject:** This study included 60 elderly patients and older.

Tools: Tool I: A Structured Interview Questionnaire which consisted of three parts; part 1; demographic characteristics, part 2; Previous and current medical history of elderly diabetics and Part3; Concerned with Diabetes mellitus knowledge Tool II: Rating scale which includes two parts; part 1; parts. Health promotion life styles profile II (HPLP) factors II, and part 2; A-predisposing factors to promote health behaviors of elderly diabetics.

Results: It was found that there was a highly significant ($p < 0.001$) relation between total scores of behaviors and knowledge of elderly diabetics.

Conclusion: The applied training program is effective in improving studied elderly diabetics knowledge, health-promoting behaviors regarding diabetes mellitus.

Recommendation: The developed Health-promoting behaviors training program should be applied in diabetic clinics, family care units and geriatric home care to better control of diabetes mellitus, which lead to eliminate complications among elderly diabetics.

Keywords: *health promoting behaviors, diabetes mellitus, Elderly.*

Introduction

Aging is a biological fact that occurs outside the realm of human control, and, of course, its definition varies from one community to another. In most countries, age is an indicator of old age, where the age of (60-65) years is the age of retirement and the beginning of old age. In several other regions, age is not taken into account to determine a person's aging, as there are other factors that determine retirement age, such as: the ability to perform work, which means that, old age begins when a person is unable to participate effectively in society. (CAPMAS, 2022).

The quantity and proportion of elderly people in the world's populations are increasing, a phenomenon known as population ageing. In 2050, 1 in 6 of the world's population will be over 65, up from 1 in 11 in 2019, according to World Population Prospects 2019. In 2019, 703 million adults worldwide were 65 or older. According to projections, there will be 1.5 billion elderly adults worldwide by 2050. (United Nations, 2019).

According to the Central Agency for Public Mobilization and Statistics (CAPMAS), Number of male older persons is 3.7 million, which represents about 6.9% of total male population; also, the number of female older persons is 3.2 million, which represents about 6.4% of total female population. Life expectancy at birth is 69.7 years for males and 74.1 for Females (CAPMAS, 2022).

Diabetes is a major health issue that has reached alarming levels. Today, more than half a billion people are living with diabetes worldwide. Egypt is one of the 21 countries and territories of the IDF MENA region. 537 million people have diabetes in the world and 73 million people in the MENA Region; by 2045 this will rise to 135.7 million. **Prevalence of diabetes in adults is 18.4% about 10.9 millions adults. IDF(2022)**

As the general population continues to age, the number of adults 65 years or older affected by **diabetes** is also increasing. Diabetes is very common in older adults an estimated 33% of adults aged 65 or older have diabetes. The approach to management should be unique to each individual in this age group. Diabetes in adults 65 years and older is associated with higher risks of complications and other harmful side effects than diabetes in younger people **Endocrine(2022).**

Health promotion is the process of enabling people to increase control over, and to improve, their health. It moves beyond a focus on individual behaviour towards a wide range of social and environmental interventions. **WHO(2022).**

Health promotion improves the health status of individuals, families, communities, states, and the nation. It also enhancing the quality of life for all people, and reducing premature deaths. By focusing on prevention, health promotion reduces the costs (both financial and human) that individuals, employers, families, insurance companies, medical facilities, communities, the state and the nation would spend on medical treatment **Publichealth (2023).**

Aim of the current study was to evaluate the effect of health promoting behaviors intervention on elderly diabetics at Abu Kabir central hospital.

This aim was fulfilled through the following objectives:

1. Assess elderly diabetic's health promoting behaviors regarding diabetes mellitus pre and post the intervention.
2. Determine elderly diabetic's ability of performing health promoting behaviors regarding diabetes mellitus pre and post the intervention.
3. Design and implement health promoting behaviors intervention to support diabetes mellitus management on elderly diabetics.
4. Evaluate the effect of health promoting behaviors intervention on elderly diabetics.

Research Hypothesis: After implementing and evaluating the effectiveness of health promoting behaviors intervention on the elderly diabetics,

1. Improve Knowledge of the elderly diabetics about diabetes mellitus.
2. Acquire of positive health promoting behaviors regarding diabetes mellitus.

II. Method

1) Study Design and Settings:

A quasi-experimental design was used to conduct this study. The study was conducted at Abu Kabir central hospital's outpatient internal clinic, which located on the first floor of the Hospital at Abu Kabir city.

2) Sample:

The Purposive sample of this study comprised 118 elderly diabetics.

Sample criteria: Any elderly diabetic attending the above-mentioned settings was eligible for inclusion in the study sample once fulfilling the following criteria. **Inclusion criteria:** Aged 60 years and older with a diagnosis of diabetes mellitus, Independent in performing their daily activity and Able to cooperate and agree to participate in the study. **Exclusion criteria:** A known history of major psychiatric illness or severe physical disorders. (Reported by elderly diabetics).

3) Sample size calculation:

It was calculated by statistical computer program (Epi-Info software version 6.04). It was based on assuming difference between pre and post intervention of improving health promoting behaviors among elderly diabetics after the intervention to be 25% with power 80% and at confidence level 95%, so, the total sample size calculated will be 118 diabetic elderly (Fereshteh, et al., 2018).

4) Tools for data collection:

A: Structured interview questionnaire

It was developed by the researcher after reviewing the related literature to collect the necessary data for the study. It composed of three parts:

Part 1: Demographic characteristics of the studied elderly:

Entails data about demographic characteristics of the studied elderly such as; age, gender, marital status, educational level, occupation before retirement, current occupation, residence, income, and income source. It included 13 questions

Part 2 Previous and current medical history of diabetes mellitus elderly, which includes 5 questions. It included time of having diabetes, family history of diabetes, discovering diabetes and types of physical illness.

Part 3 Concerned with Diabetes mellitus knowledge questionnaire (DKQ), which includes 24 questions. This questionnaire was developed by the researcher guided by Garcia (2001), Starr County Diabetes Education Study, to elicit information about patients' understanding of the cause of their disease, its associated complications, blood glucose levels, diet, and physical activity.

Tool II: Rating scale, which includes two, parts (Appendix II):

Part 1: Health promotion life styles profile II (HPLP) factors II. The HPLP-II questionnaire was developed by Walker et al (1995) based on Pender's health promotion model to measure health-promoting behaviors translated to Arabic and modified by researcher to meet the Egyptian culture. This questionnaire consists of the six aspects of health-promoting behaviors, including

- a- Nutritional behaviors includes 13 items
- b- Physical activity "exercise behaviors" includes 5 items
- c- Spiritual growth behaviors includes 10 items
- d- Health responsibility behaviors includes 11 items
- e- Interpersonal relations "social support" includes 6 items
- f- Stress management includes 7 items

The health promotion model represents a theoretical viewpoint that explores the factors contributing to health-promoting behaviors, the improvement of health and quality of life.

Part 2 A-predisposing factors to promote health behaviors of elderly diabetics includes 21 items e.g. environmental safety such as adequate lighting- lighting during night – waking carefully-House furniture- dry house grounds]

B-Reinforcing persons to promote health behavior of elderly diabetics includes 6 items e.g [Family, Friends and Medical team]

Pilot study

Before performing the main study, a pilot study was carried out on 12 elderly from the study setting, constituting about 10% of the calculated sample for main study. They were selected randomly from outpatient clinics, Abu Kabir Central hospitals (internal Clinic), and were later excluded from the main study sample of research work to assure stability of the answers. The purposes of pilot were to test the questions for any obscurity, and to assess the practicability and feasibility of using the structured interview questionnaire sheet for the elderly. It also helped the researcher to determine the time needed for filling out the forms, which turned to be 30 to 45

minutes. The tools were finalized after doing necessary modifications according to the pilot study results.

D. Fieldwork

Before starting any step in the study, an official letter was issued from postgraduate department, Faculty of Nursing, Zagazig University to the General Secretary of the Medical Director of Abu Kabir Central Hospital to request permission and cooperation to conduct the study. The fieldwork was carried out within the period of nine months, starting from the beginning of November 2020 up to the end of July 2021.

Assessment phase: This phase involved the pre-program data collection for baseline assessment. Participants were interviewed by the researcher who introduced himself and explained the aim of the study briefly seeking their agreement in the study, and reassured them that information obtained is strictly confidential and would not be used for any purposes other than research.

Planning phase: Based on the results obtained from the data analysis of the assessment phase, and in view of the relevant literature about proper body mechanics, the researcher developed the proper body mechanics training program for elderly diabetics and sessions content according to the elderly needs and the study objectives.

❖ The health promoting behaviors training program for the elderly diabetics consisted of ten sessions as follows:

➤ Session 1: (Time: 30minutes)

The main objective of this session was to improve elderly diabetic's knowledge about parts of the aging process (basic anatomy and physiology of the pancreas and age related changes)

➤ Session 2: (Time: 45 minutes)

The main objective of this session was to enhance elderly diabetic's knowledge about diabetes on elderly (definition, causes and risk factors, signs and symptoms, diagnostic measures, pharmacological and non- pharmacological management).

➤ Session 3: (Time: 30 minutes)

The main objective of this session was to help the elderly diabetic to identify the complications of diabetes mellitus, the daily behaviors and factors that increase this complications, and coping with diabetes mellitus.

Session 4: (Time: 45 minutes)

The main objective of this session was to promote elderly diabetic's knowledge about Health promoting behaviors regarding diabetes mellitus (definition, components such as, Nutritional behaviors, physical activity, Spiritual growth behaviors, Health responsibility behaviors, Interpersonal relations "social support", and Stress management.

➤ Session 5: (Time: 30 minutes)

The main objective of this session was to improve elderly diabetic's healthy nutrition and physical activity awareness.

➤ *Session 6: (Time: 45 minutes)*

The main objective of this session was to help elderly diabetic's apply physical activity such as walking, stair climbing, weight lifting, and aerobic exercise

➤ *Session 7: (Time: 30 minutes)*

The main objective of this session was to help the elderly perform spiritual growth and stress management such as praying, Quran recitation, meditation, and mindfulness and relaxation techniques.

➤ *Session 8: (Time: 30 minutes)*

The main objective of this session was to improve elderly diabetic's Health responsibility awareness such as vaccination, laboratory tests and periodic checkup.

➤ *Session 9: (Time: 45 minutes)*

The main objective of this session was to improve elderly diabetic's Interpersonal relations "social support" needs such as family and community relation.

➤ *Session 10: (Time: 45 minutes)*

The main objective of this session was to enhance elderly diabetic's positive attitude regarding the Predisposing factors that support the health promoting behaviors.

Implementation phase: The program was implemented in the study setting in the form of ten sessions for small groups. This was intended to give more chance for discussions, interactions, and practical training. The total sample was divided into small groups (7 to 10 elderly in each group). All groups received the same content using the same teaching methods, media, discussions, and the same booklet. The vital signs room in the internal outpatient clinic was used for practices training.

Methods of teaching: The researcher utilized various approaches of learning in carrying out the program. These included interactive lectures, with group discussions and brain storming to exchange ideas between the elderly participants and the researcher.

Teaching media: Various media were used including power-point presentations, posters, videos, brochure and pictures. The researcher also prepared an illustrated booklet and distributed it to all of the participants to enhance the process of learning.

Evaluation phase: The evaluation of the effectiveness of the training program (posttest) was done immediately after completion the program by using the same pretest tools to evaluate the degree of improvement in elderly's knowledge, practices, pain, and disability. A follow-up testing was done after four weeks through to assess the retention of the gained improvements.

Ethical Considerations:

The study was approved by the Research Ethics Committee (REC) and the Postgraduate Committee of the Faculty of Nursing at Zagazig University, Egypt. Verbal consent was obtained from the participants after a description of the purpose of the study.

Statistical Analysis

Data entry and statistical analysis were done using SPSS 23.0 statistical software package. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations and medians for quantitative variables. Quantitative continuous data were compared using the non-parametric Mann-Whitney or Kruskal-Wallis tests and paired t test. Qualitative categorical variables were compared using chi-square test. Whenever the expected values in one or more of the cells in a 2x2 tables was less than 5, Fisher exact test was used instead. Spearman rank correlation was used for assessment of the inter-relationships among quantitative variables and ranked ones. Statistical significance was considered at p-value <0.05.

Results

Table 1 Socio-demographic Characteristics of elderly diabetics **Table 1** shows that that most of elderly diabetics aged from 65 to 70 years (62.7%) with mean (68.64 ±3.34), were female (64.5%), urban residents (72.7%), married (57.3%) and not working (75.5%) with crowding index less than 2 (89.1%)

Figure (1) Diabetic Physical complications of the studied elderly diabetics **Figure 1** indicates that, All of elderly diabetics have suffered from physical complications especially neuropathy(86.4%), hypertension (46.4%) and teeth loss (65.5%) (**Figure1**). About half of them (49.1%) had past surgical operations especially on eye (59.3%) and heart (25.9%).

Table 2 shows frequency and percentage distribution of the elderly diabetics' knowledge regarding diabetes throughout the study phases. It was observed that 37.3% of elderly diabetics agreed that the usual cause of type 2 diabetes is increase insulin resistance in the body cells and an insulin reaction is caused by too much food before implementation of the program. This percentage increased up to 100% and 81.8% respectively in the post phase. The difference was highly statistically significant (p<0.001).

Figure (2) the elderly diabetics' knowledge regarding diabetes throughout the study phases **Figure 2** 27.3% of them agreed that the best way to check their diabetes was by testing HbA1c before implementation of the program. This percentage was improved up to 85.5% in the post phase. The difference was highly statistically significant (p<0.001).

Figure 3 Total mean scores of the studied elderly diabetics' knowledge regarding Diabetes throughout study phases. **Figure 3** there was highly significant increase in total mean score of the studied elderly diabetics' knowledge in post intervention phase (21.3) compared to pre intervention phase (12.9).

Table 3 there was highly significant (p<0.001) improvement in total good scores of behavior of elderly diabetics and its domains in post intervention phase compared to pre intervention phase.

Figure (4): Total mean scores of the studied elderly diabetics' behavior **Figure 4** reveals that there was highly significant increase in total mean score of the studied elderly diabetics' behavior in post intervention phase (148) compared to pre intervention phase (109.13).

Table 4 shows that there was a highly significant ($p<0.001$) correlation between total scores of behaviors and knowledge of elderly diabetics throughout study phases.

Table 5 reveals best fitting multiple linear regression for predicting factors, which affect total behavior score. It was found that education, insurance, how to discover diabetes, knowledge score and crowding index had positive highly significant ($p<0.001$) effect on behavior score.

Table 1: Socio-demographic Characteristics of elderly diabetics (n=110).

Socio-demographic Characteristics	No.	%
Age (year)		
60-	18	16.4
65-	69	62.7
70-75	23	20.9
Mean ± SD	68.64 ±3.34	
Sex		
Male	39	35.5
Female	71	64.5
Residence		
Rural	30	27.3
Urban	80	72.7
Marital status		
Single	6	5.5
Married	63	57.3
Divorced	37	33.6
Widow	4	3.6
Education level		
Illiterate	11	10.0
Read & write	0	0.0
Basic education	33	30.0
Moderate	43	39.1
Above moderate	9	8.2
University	14	12.7
Post graduate	0	0.0
Occupation		
Not working	83	75.5
Working	27	24.5
If working, what is occupation (n=27)		
Carpenter	4	14.81
Engineer	2	7.41

Farmer	5	18.52
General manager	2	7.41
Nurse	8	29.63
Secretary	1	3.70
Supervisor	3	11.11
Teacher	2	7.41
Crowding index		
≤2	98	89.1
>2	12	10.9
Source of income		
Retirement	100	90.9
Property revenues	3	2.7
Family help	7	6.4
Monthly income		
Not enough	73	66.4
Enough	37	33.6
Enough & saved	0	0.0
Health Insurance		
Yes	62	56.4
No	48	43.6
Who live with		
Family	102	92.7
Alone	8	7.3
Social class		
High	14	12.7
Moderate	43	39.1
Low	53	48.2

Figure (1): Distribution of the studied elderly according to their educational level

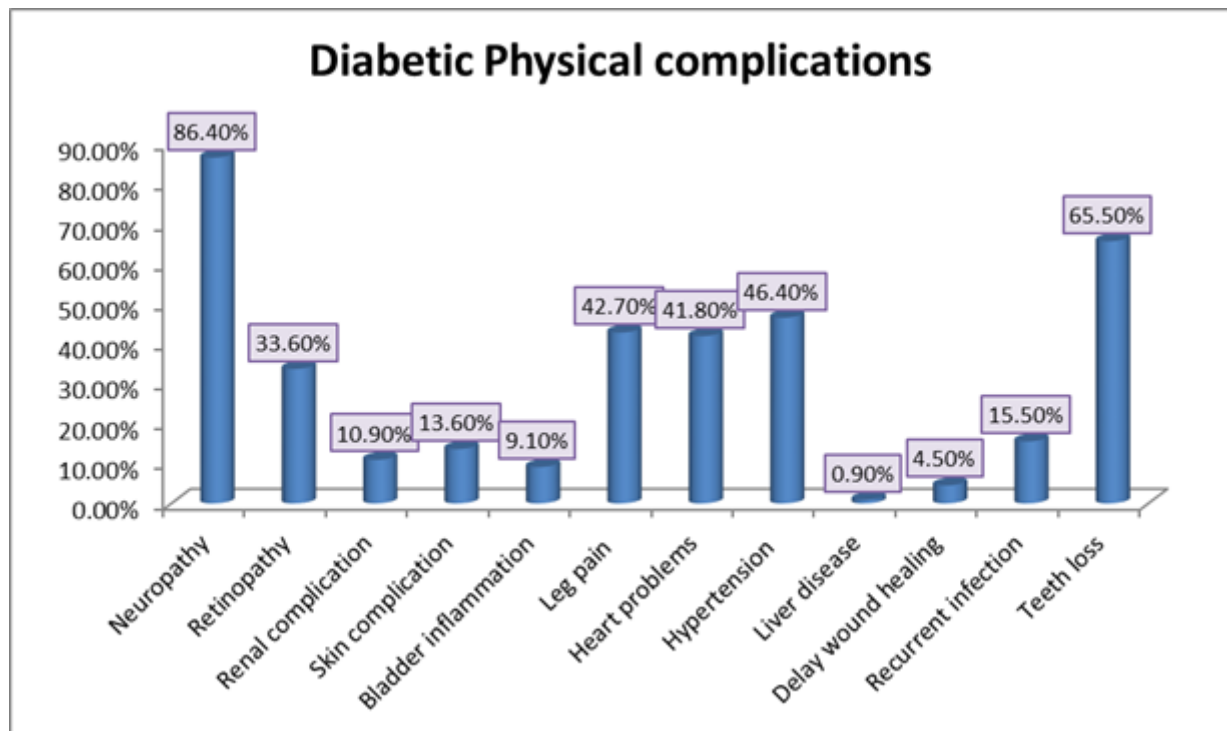


Table (2a): 'The elderly diabetics' knowledge regarding Diabetes throughout the study phases

Item	Time	Yes No. (%)	No No. (%)	I don't know No. (%)	^{MH} p-value
Eating too much sugar and other sweet foods increase risk of having diabetes.	pre	92 (83.6)	7 (6.4)	11 (10.0)	0.001**
	Post	110 (100.0)	0 (0.0)	0 (0.0)	
The usual cause of type 2 diabetes is increase insulin resistance in the body cells	pre	41 (37.3)	19 (17.3)	50 (45.5)	0.001**
	Post	110 (100.0)	0 (0.0)	0 (0.0)	
Type 2 Diabetes also caused by failure of the Pancreas to produce enough insulin that control blood sugar	pre	60 (54.5)	19 (17.3)	31 (28.2)	0.001**
	Post	110 (100.0)	0 (0.0)	0 (0.0)	
Pancreas produce insulin to control blood sugar.	pre	38 (34.5)	13 (11.8)	59 (53.6)	0.001**
	Post	110 (100.0)	0 (0.0)	0 (0.0)	
In untreated diabetes, the amount of sugar in the blood usually increases above 140	pre	71 (64.5)	13 (11.8)	26 (23.6)	0.001**
	Post	100 (90.9)	0 (0.0)	10 (9.1)	
If I am diabetic, my children have a higher chance of being diabetic.	pre	57 (51.8)	19 (17.3)	34 (30.9)	0.001**
	Post	110 (100.0)	0 (0.0)	0 (0.0)	
Diabetes cannot be cured.	pre	55 (50.0)	41 (37.3)	14 (12.7)	0.001**
	Post	100 (90.9)	10 (9.1)	0 (0.0)	
A fasting blood sugar level of 210 is too high	pre	54 (49)	28 (25.5)	28 (25.5)	0.001**
	Post	102 (92.7)	0 (0.0)	8 (7.3)	
The best way to check my diabetes is by testing my HbA1c.	pre	30 (27.3)	29 (26.4)	51 (46.4)	0.001**
	Post	94 (85.5)	0 (0.0)	16 (14.5)	
Regular exercise will decrease the need for insulin or other diabetic medication	pre	12 (10.9)	29 (26.4)	69 (62.7)	0.001**
	Post	102 (92.7)	0 (0.0)	8 (7.3)	
There are two main types of diabetes: Type 1 (insulin-dependent) and Type 2 (non-insulin-dependent).	pre	17 (15.5)	22 (20.0)	71 (64.5)	0.001**
	Post	102 (92.7)	0 (0.0)	8 (7.3)	
An insulin reaction is caused by too much food.	pre	41 (37.3)	14 (12.7)	55 (50.0)	0.001**
	Post	90 (81.8)	0 (0.0)	20 (18.2)	

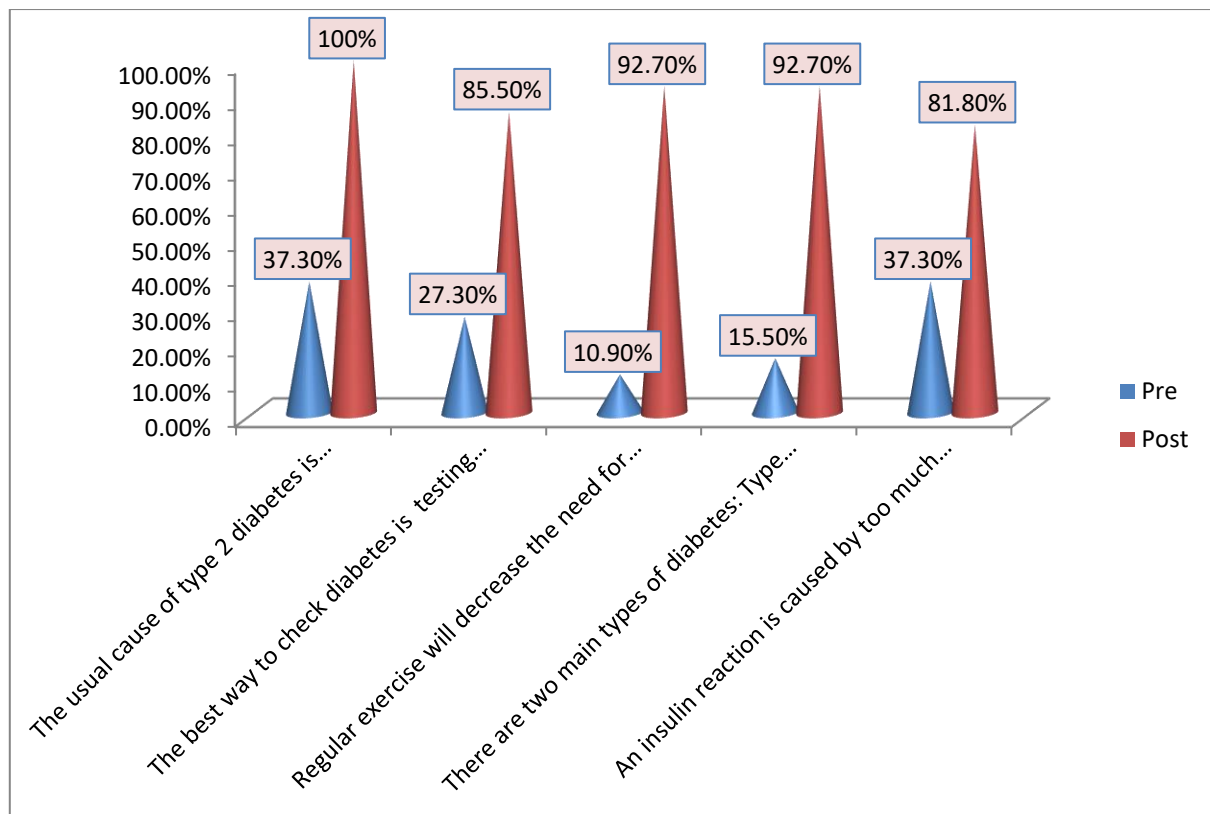


Figure (2): The elderly diabetics' knowledge regarding diabetes throughout the study phases

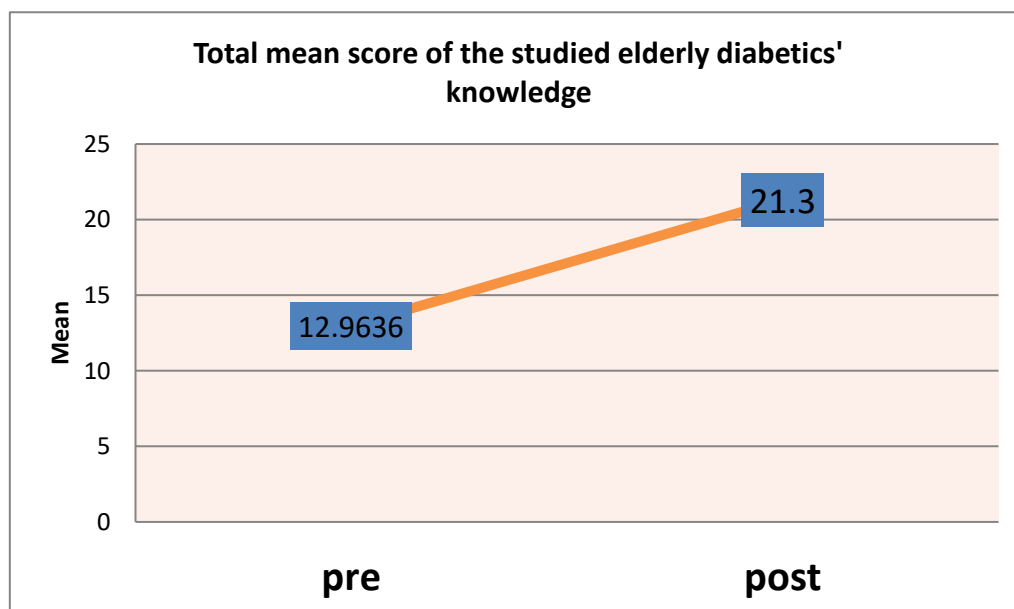


Figure (3): Total mean scores of the studied elderly diabetics' knowledge regarding Diabetes

Table (3): Total scores of the studied elderly diabetics' behavior and its domains

Domains of behavior	Pre			Post			MH p
	Poor	Moderate	Good	Poor	Moderate	Good	
Nutrition	0 (0.0)	79 (71.8)	31 (28.2)	0 (0.0)	11 (10.9)	99 (90.0)	<0.001**
Physical activity	85 (77.3)	23 (20.9)	2 (1.8)	0 (0.0)	12 (10.9)	98 (89.1)	<0.001**
Spiritual growth	0 (0.0)	37 (33.6)	73 (66.4)	0 (0.0)	10 (9.1)	100 (90.9)	<0.001**
Health responsibility	5 (4.5)	64 (58.2)	41 (37.3)	0 (0.0)	9 (8.2)	101 (91.8)	<0.001**
Social relations	2 (1.8)	44 (40.0)	64 (58.2)	0 (0.0)	8 (7.3)	102 (92.7)	<0.001**
Stress management	16 (14.5)	67 (60.9)	27 (24.5)	0 (0.0)	6 (5.5)	104 (94.5)	<0.001**
Total	0 (0.0)	99 (90.0)	11 (10.0)	0 (0.0)	10 (9.1)	100 (90.9)	<0.001**

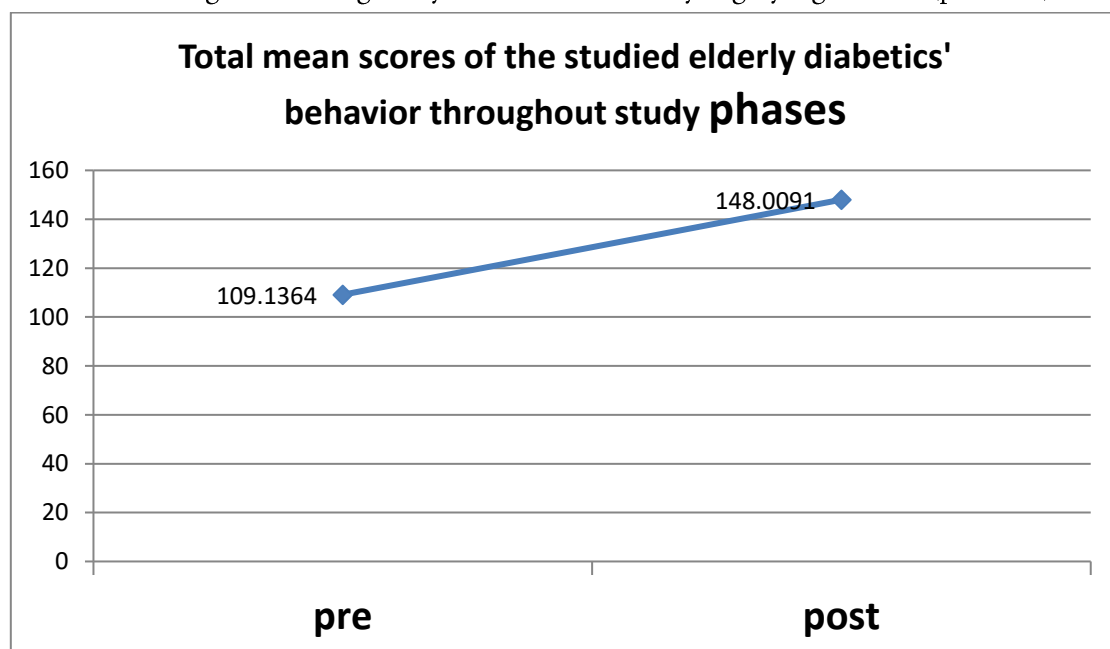
MH: Marginal Homogeneity Test, **: statistically highly significant ($p < 0.001$)**Figure (4): Total mean scores of the studied elderly diabetics' behavior**

Table (4): Correlation coefficient between total scores of behavior and knowledge

Parameter		Behavior score			
		Pre Intervention		Post Intervention	
		(r)	P	(r)	P
knowledge score	Pre	0.597	0.001**		
	Post			0.354	0.001**

** : statistically highly significant ($p < 0.001$), r: correlation coefficient

Table (5): Best fitting multiple linear regression for predicting factors which affect total behavior score (n=110).

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	47.401	3.445		13.758	.001**	40.540	54.262
Education	4.844	.280	.971	17.320	.001**	4.287	5.401
Insurance	9.880	.773	.671	12.783	.001**	8.341	11.419
Discovery	6.897	.533	.931	12.941	.001**	5.836	7.959
Knowledge score	.472	.063	.459	7.533	.001**	.347	.596
Crowding index	5.695	.896	.426	6.355	.001**	3.911	7.480

** : statistically highly significant ($p < 0.001$) R-square=0.863, ANOVA: F= 96.834, $P < 0.001$

Discussion

DM is a significant public health concern in Egypt. The prevalence of diabetes is escalating to alarming levels. Therefore, it is important to consider the risk factors that are prevalent in Egyptian society and have contributed to this escalating issue. Obesity, sedentary lifestyle, hepatitis C infection, pesticides, smoking, and poor eating habits are the primary causes of the rapidly increasing prevalence of DM (Abouzid et al., 2019).

Concerning demographic characteristics of the studied elderly (table 1) revealed that the mean age of the studied elderly diabetics was (68.64 ± 3.34), years. The increasing mean age of the elderly diabetics may reflect the universal trends of diabetic patients living longer due to improving health care systems and diabetes standards of care performed in diabetic clinics. This finding might be due to the increase of the proportion of the young age compared with the old and oldest old and in Egypt the elderly from 60 to 74 (young-old) is majority of aged population CAMPAS (2022). This was in accordance with a study done in US, by Cigolle et al. (2022)

who found that the mean age of elderly diabetics was 67.4 years. This finding is also close to the mean reported by Ghazi. (2022) in Egypt (66.59 years).

Regarding the gender, the study finding revealed that females recorded a higher incidence of Diabetes mellitus than males, where more than half of females (64.5%), in the current study had diabetes compared to less than half of males. Similar findings have been found in US, by Cigolle et al. (2022), and study conducted in Egypt at Mansoura University by ghazi (2022) also, a study conducted in Ghana, by Gatimu et al. (2016) where both studies found that the incidence of diabetes mellitus was more among female than the male.

Concerning the level of education, the current study result revealed that the more than half of the elderly diabetics had moderate or basic level education. This is particularly evident because the sample included elder persons above sixty years from old generations where basic education was still not compulsory as nowadays. This low level of education would certainly influence patients' self-care practices, and consequently their feet health status as will be elaborated. In the same line the study conducted in Palestine by Abu Obaid and Eljedi (2015) who found that individuals with high level of education have better understanding of their disease, more aware of suspected complications and have more flexibility to improve their health promoting behaviors. This study is similar to the study conducted in Egypt at Zagazig city by salah (2016) who found that three quarter of the elderly diabetics had low level of education.

Regarding the social class level, the current study revealed that the majority of the elderly diabetics belonged to low social class. This might be due to that elderly diabetics had not enough income and the Egyptian economic crisis that lead to inflation of food, medicine prices and various aspects of life needs. The elderly diabetics did not had the ability to buy the healthy food, medications, having the medical care and periodic checkup. This may affect the elderly diabetic's health promoting behaviors toward diabetes mellitus. In the same context the study conducted in Iran by Steptoe et al. (2020) found that that lower SES is related to accelerated aging across a broad range of functional abilities and phenotypes independently of the presence of health conditions and that social circumstances impinge on multiple aspects of aging. In contrast, the study conducted in Egypt by Hegazi et al. (2015) who found that Availability of different varieties of processed food and particularly processed meat and dairy products led to their higher consumption, especially in urban cities and among Egyptians from the higher socioeconomic class.

According to Diabetic Physical complications, this study showed that more than two thirds of the studied elderly diabetics had suffered physical complications especially neuropathy, This result might be due to This may due to the long disease duration among them that affecting the physical function of the body. It is known that the complications of diabetes, especially the neuro-vascular problems increase with advancing age. This meets the finding of the study conducted by Simo et al. (2020) who revealed that, polyneuropathy proved symptomatic in 78% of older adult with diabetes. Additionally, a study conducted by Abd El-Ghany et al.

(2021) at Mansoura city noticed that the majority of the elderly diabetics had neuropathy specially who had high HBA1C.

The study finding also shows that the majority of the elderly diabetics have inadequate knowledge about diabetes mellitus disease (types, causes, right action in hypo and hyper glycaemia). This result is in agreement with the study conducted in Vietnam by **Nguyen et al (2020)** who found that Older patients with diabetes had high levels of perceived severity attitudes on diabetes mellitus. However, the knowledge and practice levels were still inadequate. On the other hand, the current study revealed that most of the elderly diabetics had inadequate knowledge about diabetes' eye complication in the same line, the result of study in South Africa by **VanStaden et al (2015)** who found that three quarter of the participants in this study had inadequate knowledge about ocular complications of diabetes mellitus. In the same line the study conducted in Alexandria by **Kassab et al (2022)** who found that diabetic foot care knowledge was poor in two third of patients.

Concerning the improvement of the knowledge about diabetes disease after the program intervention, there were highly significant increase in total mean score of the studied elderly diabetics' knowledge in post intervention phase (21.3) compared to pre intervention phase (12.9). This result is in agreement with the study conducted at Assiut University hospitals by **Khalaf, et al.(2019)** who found that the mean score of knowledge and attitude showed significant improvement (5.3), respectively in pretest vs 16.8, respectively in posttest) among the diabetic patients ($p < 0.001$).

Concerning correlation between total scores of behaviors and knowledge of elderly diabetics throughout study phases, It was found that there was a highly significant ($p < 0.001$). This finding was supported with **Ewais et al (2021)** who found that, there was a positive highly statistically significant correlation ($P = 0.00$) between total elderly knowledge, total health beliefs, and total self-care practices.

Conclusion

Based upon the findings of the present study and answer of hypothesis, it was concluded that pre the training program the studied elderly diabetics had unsatisfactory diabetes mellitus knowledge, inadequate health promoting behaviors. The applied training program is effective in improving studied elderly diabetics knowledge, health-promoting behaviors regarding diabetes mellitus.

Recommendations

- ☞ *On the basis of the current study findings*, The developed Health-promoting behaviors training program should be applied in diabetic clinics, family care units and geriatric home care to enhance health promoting behaviors which lead to better control of diabetes mellitus, and eliminate complications among elderly diabetics. Provide health promoting behaviors educational program for the healthcare providers in the diabetic clinics to get their support and interests on applying the health promoting behaviors training program in diabetic clinics.

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