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Effect of Nursing Intervention Programs on Improving Caregivers Performance Regarding Type II Diabetes Mellitus Management in Elderly People

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Abstract: Background: The treatment goals for type 2 diabetes in the elderly are potentially no different from those for younger patients. Therapy is aimed at attaining optimal levels of serum glucose, training caregivers in skills essential for the day to day management of elderly with diabetes. **Aim of the study**: was to evaluate the effect of nursing intervention programs on improving caregivers performance regarding type II diabetes mellitus management in elderly people. **Subjects and Methods: Research design:** A quasi-experimental design was used. **Setting**: The study was conducted at six nursing homes in **Cairo. Subjects**: Fifty-six caregivers from the previously mentioned settings were included in the study. **Tools of data collection**: Two tools were used: **Tool (I):** Caregiver's knowledge about management of diabetes mellitus, self-administered questionnaire. **Tool (II):** Caregiver's practice observation checklist. **Results**: The main points of knowledge that improved by nursing intervention were as follows; complications of diabetes from 32.1% in pre-sessions, to 98.2% immediately post sessions and 82.1%, at 3 months of post sessions. Additionally, Care of diabetic foot, from 50.0% in pre-sessions, to 94.6% immediately post sessions and 83.9%, at 3 months of post sessions. Moreover, the role of exercise and nutrition in type II DM management improved, from 16.1% in pre-sessions, to 100% immediately post sessions and 98.2%, at 3 months of post sessions. Furthermore, the total practice score of the studied caregivers were scored as good practice level by 0.0% in preprogram implementation which improved to 83.9% & 62.5% in post and follow up program implementation respectively. **Conclusions:** The present study concluded that caregivers' performance was greatly improved immediately after implementation of nursing intervention. Unfortunately, this improvement slightly declined in the next three months. **Recommendations:** The study recommended continuous in-service training for caregivers about its management regarding diabetes mellitus.

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Key words: Caregivers, type II diabetes mellitus Performance, programs, Elderly people.

1. Introduction:

Management of elderly people with type 2 diabetes mellitus (DM) is aimed at attaining optimal levels of serum glucose, avoiding hypoglycemic episodes, preventing the acute complications of uncontrolled hyperglycemia, and preventing or delaying the progression of the chronic complication of diabetes. Moreover, the principles of managing type 2 diabetes mellitus in the elderly are no different from those in younger, but the priorities and therapeutic strategies need to be cautiously individualized. **(Du et al., 2014; Carpenter et al., 2019).**

The objectives of treatment are to improve glycemic control in a stepwise approach that involves non-pharmacological methods including diet and exercise, and pharmacological therapy including mixtures of oral anti hyperglycemic agents alone or in combination with insulin. Furthermore, diet and exercise remain the cornerstone of diabetes management. Diet should be designed to provide sufficient calories to achieve or maintain ideal bodyweight (**Thent et al., 2013)**.

The aging population is growing worldwide and the proportion of people above 60 years old accounts for 15% of the whole population which is estimated to be 7.5 billion **(Chentli et al., 2015).** In general, 20% of old people have diabetes mellitus (DM), and a similar proportion has undiagnosed DM **(Sinclair et al., 2012)**. Frequencies vary from 18% to 33% **(Kirkman et al., 2012).** Additionally, DM is becoming an alarming public health problem in developed and even in developing countries **(Crandel, 2015).**

Furthermore, of all the diseases, diabetes mellitus

is the single most disease affecting a large number of elderly populations along with hypertension. Diabetes and its complications take a major consequence on the quality of life of the elderly and the healthcare costs of the society. The management of diabetes in elderly requires special care and attention. Older adults with diabetes have the highest rates of major lower-extremity amputation, myocardial infarction, visual impairment, and end-stage renal disease **(Kirkman et al., 2012).**

Nursing homes are much more common at older ages; in 2015, about one in eight people aged 85 or older (13%) resided in nursing homes, compared with 1% of people ages their ranging 65 to 74 **(Doty, 2015)**. There were 1.4 million people in nursing homes nationally and 8.9 million informal caregivers provide care to someone aged 50 or more with dementia. The number of caregiver's households in the U.S. for persons aged 60 or more could reach 39 million **(National Alliance for Caregiving, 2015).** Caring for elderly who has diabetes can be a daunting task. Having a plan for getting through the day can help both caregivers and patients cope. Nursing home in the United Kingdom has an average of four co-morbid conditions in addition have significant care needs and deficiencies **(Gadsby et al., 2011).**

The community health nurse (CHN) has an important role to play in the management of diabetes. The CHN has the responsibility of teaching the self-injection of insulin to the elderly and the caregivers and she has to begin this as soon as the need for the insulin has been established and use written or verbal instructions and demonstration techniques for teaching the caregivers **(James et al., 2014).**

Significance of the study:

The impact of diabetes mellitus is alarming. The conditions account for an estimated 86% of deaths and 77% of the disease burden in the European Region **(World Health Organization, 2016).** Egypt prevalence of diabetes has reached epidemic proportions which are the sixth most important cause of disability burden in Egypt **(National Institute Center of Health and Population, 2004).** By the year 2030; it will affect at least 8.6 million adults, which are responsible for 2.4% of all years of life lost **(Arafa & Amin, 2010).** Recently, due to the increasing usage insulin therapy with diabetic elderly, more emphasis should be given to the standardization and improvement of insulin administration technique.

Aim of the study:

The aim of this study was to evaluate the effect of nursing intervention programs on improving caregiver's performance regarding type II diabetes mellitus management in elderly people. **This was accomplished through the specific objectives:**

1. Assess caregivers' knowledge and practices prior and after the nursing intervention sessions regarding management of diabetes mellitus.
2. Investigate the relation between caregivers' knowledge and practice regarding management of diabetes mellitus.
3. Plan, implement, and evaluate the effect of nursing intervention programs on improving caregiver's performance regarding management of diabetes mellitus.

Operational definitions:

- **Caregivers** any person assist the elderly with activities of daily living (ADLs), including bathing/showering, dressing, feeding, personal hygiene and grooming, transfers and mobility within the nursing home. Caregivers also assist with administering and supervising medications.

Hypotheses:

- Caregivers' knowledge and practices score toward diabetes mellitus management will be improved after nursing intervention programs.

2. Subject s and Methods

Study design:

Quasi-experimental interventional designs to study the effect of nursing intervention programs on improving caregiver's performance regarding type II diabetes mellitus management in elderly people.

Study setting:

In Cairo there were 64 nursing home provided care for elderly. 6 home out of 64 were selected according to number of caregivers & elderly attended, these were namely: Beit Al-Ailla in the fifth assembly, Honoring Egyptian Women Hotel, Dar Al-Habayeb in Degla, Maadi, Dar Om-Kalthoum, Dar El-Safa, and Dar El-Marwa. The current study was conducted in Cairo governorate because there are no nursing with full residency homes in Zagazig, Sharkia Governorate.

Study subjects

All caregivers in the above-mentioned setting were included. Total samples of 56 caregivers were recruited for the conduction of this study from nursing homes in Cairo Governorate

Tools of data collection:

Tool (I): Caregiver's knowledge, self-administered questionnaire. It was Composed of two parts:

Part (A):

Caregiver's socio-demographic characteristics, for collecting data pertaining to the caregivers such as; age, sex, marital status, residence (rural/urban), qualification, income, previous courses, and years of experience **(Q1-Q8).**

Part (B):

Caregiver's knowledge, self-administered questionnaire, to assess caregiver; knowledge about management of diabetes mellitus developed by the

researcher guided by **Breslin (2009), and Gadsby et al. (2011)**. This involved questions regarding caregiver's knowledge about management of diabetes mellitus as**;** definition, causes, symptoms, organ regulating blood sugar**,** diagnosis of diabetes, complications, first aid of hypoglycemia, and hyperglycemia, how to inject insulin, care of diabetic foot**,** and benefits of practicing exercise, nutritional management in type II DM. There are a number of different questions as MCQ, and essay **(Q9-Q25).**

Scoring system:

A complete correct answer was scored 2, while an incomplete correct answer was scored 1, and an incorrect answer was scored zero. For each area of knowledge, the scores of items were summed up and divided by the number of items, the total score of knowledge was (32) points. Evaluation of caregiver's knowledge was considered good if total score 75% or more, while level of knowledge, 50-<75% was considered fair, and less than 50% was considered poor.

Tool (II):

Caregiver's practice observation checklist to assess caregiver's practices regarding insulin injection. It consisted of15items, such as; gather the supplies, wash the hands, remove the caps from the insulin vial, air bubbles removing, etc**.**

Scoring system:

Each step observed "done" was scored one and the " not done" zero. Evaluation of caregiver's knowledge was considered good if total score 75% or more, while level of knowledge, 50-<75% was considered fair, and less than 50% was considered poor.

Educational sessions:

The researcher developed an intervention module in the form of an educational illustrated booklet for responding to the needs to caregivers follow the educational sessions and to serve as a reference at home guided by **Breslin (2009), Ford et al. (2010), and Gadsby et al. (2011)**, The intervention was implemented in 8 sessions; the duration of each session was 40-45 minutes at the previously mentioned settings. The intervention was implemented in 4 theoretical sessions and 4 practical sessions. The main objective of theoretical sessions was to provide knowledge about basic knowledge regarding DM as definition, causes, types and symptoms, complications, diagnosis, prevention and management of acute complications (hyperglycemia – hypoglycemia) and foot care, insulin therapy. As well as, focused on benefits of exercise and nutritional management in type II DM for elderly people.

Content validity and reliability of tools:

The validity of data collection tools and educational session's booklet were tested by a panel of 5 expertise's' (two Prof. from the Community Health Nursing, one assistance Prof. from medical surgical. Faculty of Nursing, Zagazig University, and two Prof. Expert from community department, Zagazig University, Faculty of Medicine) to assess clarity, relevance, application, comprehension, and understanding of the tools, all recommended modifications on the tools were done. Reliability of the proposed tools was done by Cronbach's Alpha test; **it was 0.859 for tool (I) and 0.780 for tool (II).**

Field work:

Data collection took a period of eight months; from beginning of from July 2016 to end of February 2017. The researcher started the data collection for 3 days per week (Thursdays, Fridays, and Saturdays) ranged from 9.00 AM to 12.00 PM during the 8 months. The execution of the study was through four phases: assessment, planning, implementation, and evaluation.

Assessment phase:

This phase involved the pre-intervention data collection for baseline assessment. The researcher first introduced herself and explained the purpose of the research briefly to the Directors and the caregivers working in the nursing homes. The Director of each nursing home nominated a social worker to assist and facilitate the administration of the questionnaires. The social worker served primarily as guide and helped in gaining access to caregivers in nursing homes and ensuring that the research will not interrupt normal caregivers' activities.

All the caregivers were met and their verbal agreements for participation were obtained. The pretest knowledge questionnaire was distributed and self-administered, and observational checklist to assess practices then the same questionnaire was used after the sessions' implementation for post assessment (post-test). The time consumed for answering the study questionnaire ranged from 40-45 minutes. The data were preliminarily analyzed to provide the basis for designing of the intervention sessions.

Planning phase:

Based on review of literature, sample features and the results obtained from the assessment phase, the researcher designed the intervention sessions and sessions' content. The learning booklet was prepared by the researcher and its content was validated and then distributed to caregivers to be used as a guide for self-learning. The sessions were conducted in Arabic language to be easily understood.

General objective:

The general objective of the caregivers' sessions was to upgrade caregivers' knowledge, and practices towards elderly people with type 2 diabetes mellitus.

Specific objectives*:* By the end of the sessions, the caregivers should be able to;

- Define diabetes mellitus.
- List the causes of type II diabetes in elderly people.
- Mention most common symptoms of type II diabetes in elderly people.
- Identify criteria for diagnosis of diabetes militias.
- Discuss acute complications (hypoglycemia, and hyperglycemia) of diabetes mellitus.
- Manage acute hypoglycemia, and hyperglycemia emergency in elderly people.
- Identify the foot care.
- Recognize benefits of exercise in elderly people.
- Choose the of nutritional therapy in elderly people.
- Demonstrate the importance of follow-up for elderly people with DM in elderly people.
- Apply the practice of insulin injection correctly.

Implementation phase:

The intervention was performed in the form of sessions; these were implemented in the library of the nursing homes. To ensure give all caregivers the same learning experience, all of them received the same content using same training methods. The educational training methods were lecture, group discussion and brain storming, role play, and demonstration. The sessions were aided by using video, pictures and posters through laptop, and data show, to facilitate and illustrate teaching, to ensure that the caregivers understand the content. Each session was started by a summary about what was given through the previous session, followed by the objectives of the new one. The intervention was implemented in 3 sessions; the duration of each session was 40-45 minutes at the previously mentioned settings, the total time of sessions was 7 – 8 hours. The number of caregivers in each session was 3-10 caregivers in order to facilitate learning process and allow each caregiver to participate as well as ensure adequate supervision. The objectives of the sessions were as follows.

At the beginning of the first session an orientation to the session such as; the purpose, importance of the subject, contents, time and location were elaborated in order to establish good communication. As well as the researchers explain the basic knowledge regarding DM as definition, causes, and symptoms of type II diabetes in elderly people. The second session was focused on diagnosis of diabetes, complications and the management for hypoglycemia, and hyperglycemia in elderly people. Additionally. The third session was focused on the care of diabetic foot composed of three components the first components include; tips about foot care as never walk barefoot, Wash the feet every day with mild soap and warm water, use lotion to keep the skin of the feet soft and moist, trim the toe nails straight across, always keep the feet warm, avoid smoking effects of smoking on peripheral vessels. Presence of peripheral vascular diseases and peripheral neuropathy can increase risk of diabetic foot and amputation. Inspect the feet every day, look for puncture wounds, bruises, pressure areas, redness, blisters, ulcers, cuts, and nail problems, use a mirror if unable to do it alone, and Examine the bottom of the feet and toes. Check the six major locations on the bottom of each foot as the tip of the big toe, the base of the little toes, the base of the middle toes, the heel, the outside edge of the foot, and across the ball of the foot. Finally, choose foot were. a poor fitting shoe can cause an ulcer and lead to diabetic foot. Furthermore, third session includes benefits of exercise and nutritional management of type II diabetes mellitus in elderly people. Finally, the fourth session focused on the importance of follow-up for elderly people with DM, and applies the practice of insulin injection, and global summarization and revision of the aim of the session and termination module sessions. As well as, evaluate the effect of nursing intervention programs on improving caregivers' performance regarding management of diabetes mellitus.

Evaluation phase:

Evaluation of the health educational intervention was done immediately after its implementation of the sessions, as well as a follow-up evaluation after three months through applying the same tools of the pretest.

Pilot study:

Before conducting the main study, a pilot study was carried out on 10% of the study sample who were later excluded in the main study. The purpose of the pilot study was to test the questions for any ambiguity, inapplicability, and feasibility of the tools, accordingly the necessary modifications were done. It also helped the researcher to estimate the time needed for filling in the forms.

Administrative and ethical considerations:

Permission to carry out the study was granted by submission of official letter from the Faculty of Nursing to the responsible authorities of the study settings to obtain their permission for data collection. All ethical issues were taken into consideration during all phases of the study.

Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using the Statistical Package for Social Sciences (SPSS), version 19, developed by IBM, Illinois, and Chicago, USA. For numerical values the range mean and standard deviations were calculated. The differences between two mean values were calculated using student's t-test. Differences of mean values between more than two groups were

tested by analysis of variance (F). The differences between mean score values in relation to socio-demographic variables were tested using Mann-Whitney test. For categorical variable the number and percentage were calculated and differences between subcategories before, immediately after and at follow up were tested using Friedman Chi Square test. The correlation between two variables was calculated using Pearson's correlation coefficient. The level of significance was adopted at $p<0.05$.

3. Results:

Table 1 shows that 50.0% of the studied caregivers their ages ranged 20-<30 years with a mean age of 31.89+11.77 years and76.8% of them were living in rural areas. Concerning the marital status of caregivers 46.4% of them were married. The same table also demonstrates that 58.9% of them had university education.

Table (1): Socio-demographic Characteristics of Studied Caregivers (n=56)

Variables	No	%
Age (in years):		
<20	3	5.4
20-	28	50.0
30-	10	17.9
40-	11	19.6
50-	4	7.1
Range	18-56	
Mean+SD	31.89+11.77	
Gender:		
Males	14	25.0
Females	42	75.0
Residence:		
Urban	13	23.2
Rural	43	76.8
Marital status:		
Single	24	42.9
Married	26	46.4
Divorced	3	5.4
Widow	3	5.4
Educational level:		
Diploma	23	41.1
University	33	58.9
Family income:		
Just sufficient	35	62.5
Insufficient	21	37.5

Table 2 describes that 55.4% of caregivers did not attend any previous courses. In addition, 44.6% of the studied caregivers attended previous courses about how to deal with old age and insulin injection. The same table also demonstrates that 60.7% of the study caregivers reported previous experience in nursing homes less than five years.

Table 3 portrays that, 30.4% of the studied caregivers identified the definition of DM at preprogram compared to 91.9% and 85.7% at post and follow up respectively. A considerable change was noticed between the studied sample at pre, post and follow up program implementation related to causes of type 2 of DM among the studied caregivers (X^2= 80.381 at p= 0.001). Additionally, 37.5% of them identify understand the management of hypoglycemia preprogram compared to and 96.4, 92.9%, at post and follow up respectively. 50.0% of the studied caregivers identified care of diabetic foot at preprogram compared to 94.6%, and 83.9% at post and follow up respectively. And mention benefits of exercise and nutritional management in type II DM from preprogram 16.1%, compared to 100% and 98.2% at post and follow up respectively.

Table (2): Previous Training and Work Experience of Studied Caregivers (n=56)

Variables	No	%
Previous courses:		
No	31	55.4
Yes	25	44.6
Years of experience:		
<5	34	60.7
5-	9	16.1
10-	5	8.9
15-	5	8.9
20-25	3	5.4
Range	1-25	
Mean+SD	6.05+648	
Median	3	

Table 4 reveals that only 14.3% wash hands before injection at preprogram compared to 75.0% and 62.5% at post and follow up intervention respectively. Additionally, none of them apply air in the syringe as the dose of medicine before injection improved to 100% and 89.3% at post and follow up intervention respectively. Similarly, none of them apply the disposal of used needles in a safety box at preprogram compared to 89.3% and 78.6% at post and follow up intervention. There were highly statistically significant differences regarding practice of insulin injection throughout the intervention phases ($P<0.001$).

Table 5 demonstrates that the total practice score of the studied caregivers were scored as good practice level by 0.0% in preprogram implementation which improved to 83.9% & 62.5% in post and follow up program implementation respectively. Meanwhile, 73.2% had poor practice at preprogram implementation that reduced to 0.0% & 14.3% in post

and follow up program implementation respectively and the difference observed was statistically significance (X2= 94.02, P=0.001).

Table (3): Distribution of Studied Caregivers According to Their Knowledge about Diabetes Mellitus throughout the Intervention (n=56)

Diabetes Information	Complete and correct						X^2	P value
	Before		Immediately after		At follow up			
	No	%	No	%	No	%		
Definition	17	30.4	51	91.9	48	85.7	70.699	0.001*
Causes of type II	8	14.3	50	89.3	43	76.8	80.381	0.001*
Organ regulating blood sugar	10	17.9	56	100	56	100	92.000	0.001*
Symptoms of diabetes	20	35.7	54	96.4	49	87.5	57.431	0.001*
Diagnosis of diabetes	2	3.6	48	85.7	45	80.4	84.553	0.001*
Complications of diabetes	18	32.1	55	98.2	46	82.1	54.488	0.001*
Causes of hypoglycemia	14	25.0	51	91.9	41	73.2	65.269	0.001*
Causes of hyperglycemia	11	19.6	53	94.6	47	83.9	74.203	0.001*
Symptoms of hypoglycemia	11	19.6	51	91.9	47	83.9	79.125	0.001*
Symptoms of hyperglycemia	14	25.0	52	92.9	43	76.8	62.000	0.001*
Diagnosis of hypoglycemia	21	37.5	55	98.2	53	94.6	64.235	0.001*
Diagnosis of hyperglycemia	24	42.9	55	98.2	49	87.5	50.688	0.001*
Management of hypoglycemia	21	37.5	54	96.4	52	92.9	63.000	0.001*
Management of hyperglycemia	7	12.5	51	91.9	48	85.7	86.306	0.001*
Procedure of insulin injection	11	19.6	56	100	48	85.7	75.174	0.001*
Foot care	28	50.0	53	94.6	47	83.9	34.710	0.001*
The benefits of exercise and nutritional management of type II diabetes militias	9	16.1	56	100	55	98.2	90.125	0.001*

*Significant

Table (4): Distribution of Studied Caregivers According to their Practice to Insulin Injection throughout the Intervention (n=56).

Insulin Injection	Done						X^2	P
	Before		Immediately after		Follow up			
	No	%	No	%	No	%		
Prepare the supplies	16	28.6	54	96.4	51	91.1	68.667	0.001*
Wash the hands thoroughly with soap and warm water.	8	14.3	42	75.0	35	62.5	49.590	0.001*
Apply air in the syringe as the dose of medicine	0	0.0	56	100	50	89.3	101.28	0.001*
Remove the caps from the insulin vial and needle.	39	23.2	54	96.4	54	96.4	74.711	0.001*
Keep insulin vial at room temperature at least for 15 minutes	32	57.1	55	98.2	47	83.9	17.455	0.001*
Wipe the stopper on top with an alcohol swab.	0	0.0	51	91.1	39	69.6	83.647	0.001*
Push the needle into the stopper and push the plunger down.	39	69.6	56	100	50	89.3	20.237	0.001*
Air bubbles removing	32	57.1	55	98.2	47	83.9	17.455	0.001*
Swab the injection site with alcohol pad.	0	0.0	50	89.3	41	73.2	85.240	0.001*
Allow it to air dry for a few minutes before inserting the needle.	0	0.0	50	89.3	40	71.4	84.000	0.001*
Frequently change site of injections	39	69.6	53	94.6	48	85.7	13.727	0.001*
Insert the needle at a 90-degree angle	29	51.8	56	100	54	96.4	30.471	0.001*
Push the plunger all the way down and wait for 10 seconds.	0	0.0	47	83.9	42	75.0	85.064	0.001*
Release the pinched skin immediately after pushing the plunger down and remove the needle.	30	53.6	56	100	56	100	34.000	0.001*
Don't rub the injection site	20	35.7	56	100	49	87.5	21.900	0.001*
Disposal of used needles in a safety box	0	0.0	50	89.3	44	78.6	17.615	0.001*

*Significant

Table (5): Distribution of Studied Caregivers according to insulin injection procedure (n=56)

Level of practice	Poor		Fair		Good		X^2	P
	N	%	N	%	N	%		
Insulin injection:							94.02	0.001*
Before	41	73.2	15	26.8	0	0.0		
Immediately after	0	0.0	9	16.1	47	83.9		
At follow up	8	14.3	13	23.2	35	62.5		

Table 6 describes that there were highly positive correlations between total knowledge score with the caregivers' diabetes knowledge and insulin injection (p= 0.022).

Table (6): Correlation between level of knowledge and practice

Variable	Diabetes knowledge	
	R	P
Insulin injection	0.307	0.022*

*Significant

Table (7): Comparison of Mean Level of Knowledge and Practice in Relation to Socio- demographic Factors

Variables	Diabetes knowledge	Insulin injection
Gender		
Males	19.8+26.4	28.6+25.0
Females	30.7+26.6	39.7+24.0
Residence		
Urban	42.7+33.4*	42.6+25.3
Rural	23.6+23.2	35.2+24.3
Marital status		
Single	27.4+25.9	35.3+27.7
Ever married	28.4+28.0	38.1+22.2
Educational level		
Diploma	21.6+23.4	34.5+24.7
University	32.5+28.5	38.6+24.5
Family income		
Enough	26.7+22.8	39.8+23.1
Not enough	26.9+33.1	32.1+26.6
Previous training		
No	20.2+23.1*	34.4+22.9
Yes	37.7+28.5	40.0+26.5

*Significant at p<0.05 (Mann-Whitney test) **Significant at p<0.01(Mann-Whitney test).

4. Discussion:

Diabetes mellitus is a chronic endocrine disorder, and it needs the definite treatment. Several complications are associated with diabetes, and with lack of proper treatment would result in life-threatening condition. Many researches have shown that exercise plays a crucial role in improving type 2 DM. Exercise not only improves the glycemic control, but it can also improve the insulin sensitivity and restore the diabetic. Unfortunately, dietary measures and physical activity do not achieve adequate glycemic control in most elderly patients with type 2 diabetes, and pharmacological intervention with an oral anti hyperglycemic agent or insulin, as monotherapy or in combination, may be required. These agents control hyperglycemia through one or more sites of action **(Rosenstock, 2001).**

Nursing home care is unique because it requires not only caring for the daily needs of individual residents, but also requires considering the needs of the resident group as a whole. Caregivers and residents have more complex relationships than nurses and patients in hospitals or other settings, as they have more frequent interactions for a longer period of time **(Tsai et al., 2014).** The study is splendid because it presents a true picture of the experiences of caregivers in Cairo nursing homes. Caregivers work in nursing home is multifaceted and is based on long-lasting relationships with their elderly **(Carlson et al., 2014).**

The targeted population in the current study was the caregivers' aged ranged 18-56 years with a mean age of 31.89+11.77 years. This disease was selected because of all the diseases; diabetes mellitus is the single most disease affecting a large number of elderly populations. Diabetes and its complications take a major consequence on the quality of life of the elderly. Many of the similar studies involved caregivers in the same diseases such as the study of **Abd-Elhameed (2010)** in Alexandria, **Egypt, Gershate et al. (2011)** in **Sweden's**, **Graue et al. (2013),** in Norway**, Shebl (2014)**, in Mansoura**, Egypt**

The sample of caregivers in the present study had a higher preponderance of female, reaching three quarters of the total. This might be due to the higher rate of women in nursing homes reflects the women nature particularly in developing countries which makes them take the major responsibility of caring elderly in nursing homes. This result was in that of agreement with **MetLife (2015)**, who found that 23% of non-working and 20% of working female caregivers are providing financial assistance to parents that they are caring. This study result was in consistence with that of the **National Alliance for Caregiving (2015),** which mentioned that, an estimated 66% of caregivers are female. Similarly, the **Family Caregiver Alliance (2015),** reported that female caregivers spend as much as 50% more time providing care than male caregivers, this result was incongruent with that of a study carried out on **Taiwanese,** by **Hsueh-Fen et al. (2004),** the convenient sample was composed of 78 male and 69 female primary caregivers of stroke survivors.

According to the present study result, more than one third of them their incomes were insufficient. This might be due to, the majority of the studied sample in the present study living in rural area, in the Egyptian economic climate, workers everywhere is carrying extra workloads, which can result in "burnout. In the same context, women who are family caregivers are 2.5 times more likely to than non-caregivers who live in poverty and five times more likely receive supplemental security income (**Rice University, 2015)**. Similarly, the **Administration on Aging (2015)** reported that 52% of women caregivers with income at or below the national median of $35,000 spend 20+ hours each week providing care.

Concerning the answering of objective regarding the assessment of caregivers' performance prior the nursing educational session, the findings of the present study revealed that, the scores of the caregivers' in the study sample were generally low. This might be due to the caregivers' in the present study not benefit of previous courses and training and this finding emphasize the urgent need for implementing diabetic intervention management. This result agreed with that of a study conducted in the **United States** by **Holt et al. (2007)**, who found that elderly people living in nursing homes receive inadequate medical care, and the care of elderly people with diabetes in extended-care facilities does not meet the American Diabetes Association (ADA) guidelines. In the same line, **Gershate et al. (2011)** showed that diabetes care in **Sweden's** home nursing services is inadequately documented. Similarly, **Graue et al. (2013),** who conducted a study in **Norway** stressed on that participants lacked confidence to manage elderly people with diabetes in nursing care settings, and lack of knowledge as well. This result was incongruent with that of **Omuemu et al. (2007)**, who mentioned that 77.3% of participants were aware on basic knowledge of management of DM. The contradiction with this study might be due to differences of location.

Additionally, the main points of the knowledge of management of DM are obvious as, care of diabetic foot. This finding congruent with **Thent et al. (2013),** stated that care of diabetic foot very important topic of management of DM because diabetic neuropathy is highly prevalent in elderly patients with type 2 diabetes. The most common manifestations of diabetic neuropathy are tingling, burning, and diminished pain sensation, primarily in the feet. This loss of sensation pre-disposes the patient to injury leading to ulceration, infection and, eventually, gangrene and amputation if significant peripheral vascular disease is present. On the same context, the role of exercise and nutrition in type II DM management. This finding emphasizes the importance of non-pharmacological drugs for management of DM. This agreement with **Rosenstock (2001)** that reported that diet and exercise remain the cornerstone of diabetes management. Diet should be designed to provide sufficient calories to achieve or maintain ideal bodyweight. Additionally, **Thent et al. (2013)** mentioned that diet that emphasizes complex carbohydrates and fiber, particularly fruits and vegetables, with lean proteins and <20% total fat should be effective in improving glucose control and reducing the need for medication. The diet should be individualized to account for the patient's lifestyle, food likes and dislikes. **Physical activity** is also an important part of diabetes management in the elderly. As with diet, the prescribed exercise regimen should be carefully individualized and slowly introduced.

In the present study regarding the practice to insulin injections revealed that, less than one third of the caregivers have fair practice regarding insulin injection. From the researcher's point of view, it might be due to the unavailability of health education sessions. Insulin therapy is a potent and lifesaving medication but if administered inaccurately had the potential to cause harm. Insulin management and prescribing errors are common due to insufficient

caregiver's knowledge which can lead to elderly harm and adverse elderly outcomes as hypoglycemia leading to client death as highlighted by **Mostafa et al. (2014).** Caregiver should have information about parameters for diabetes medications: timing with meals and activities, and identifying blood glucose levels. **(American Diabetes Association, 2004).**

Additionally, this finding was supported also by **Faria et al. (2009),** who mentioned that more than half of participants didn't know insulin doses correctly. After implementation of the health educational intervention, the objectives and hypothesis of the present study were highly achieved since the results pointed to generally higher-level scores of caregivers' practices regarding insulin injection in nursing homes. This result agreed with that of a study conducted in **Egypt** by **Atalla (2016)**, who found that 67% of the studied sample had good practice after a week of intervention, which improved more to 71% after 2 weeks post nursing intervention.

After implementation of the health educational intervention, there were statistically significant correlations between total diabetes knowledge score and insulin practice of the studied caregivers. The results of the present study might be interpreted as increased knowledge and practices levels of the caregivers are related to they were enthusiast to participate in the sessions and willing to attend future educational programs. Therefore, these sessions have been successful in the caregivers' improvement of knowledge and practice of diabetes, which gave the caregivers the information needed for caring of elderly, it also helped them to be competent in providing care for clients and consequently save effort and time needed for nursing care as well as increase self-confidence of the caregivers. These study results highlighted the importance of management of DM that allows primary, secondary and tertiary preventive measures, which reflects highly they gained education improvement of the caregivers. This finding is congruent with that of **Shebl (2014)**, in **Egypt** who found an obvious effect of the implemented sessions. The present study result revealed that, before application of the training sessions all caregiver's knowledge and practice levels were poor, while immediately after the implementation of the training sessions, the levels of knowledge and practices improved to a great extent. Highly statistically significant differences were found between total knowledge and practices scores between pre and post the implementation of the sessions. This is in accordance with a study carried out by **Farahat et al. (2008),** in **Egypt.** As well, a similar finding to the previous results also was presented in a study done by **Abd Elhameed (2010)**, in **Alexandria, Egypt.**

This finding is consistent with that of a study carried out in **Tokyo**, by **Park (2015)**, who mentioned that post sessions' implementation revealed that 88.9% of the participants acknowledged an increased awareness of safe assistance in the use of insulin. A follow-up questionnaire, distributed approximately seven months after the workshop, revealed that 82.4% of participants applied the experience and knowledge they learned at the workshop to their work. Similarly, **Lim et al. (2013),** reported that. Pre-test showed knowledge deficits in diabetes management; while post-test showed statistically significant improvement in caregivers' practice.

As regards follow up knowledge and practice scores at posttest 3 months later, the present study findings revealed a slight decrease in caregiver's knowledge and practices. This result agreed with **t**hat of **Park (2015)** in **Tokyo**, who found that despite appreciable decreases in knowledge long term, knowledge and practice retention was mild but stable. This stresses that the sessions should be repeated after a certain interval to upgrade caregivers' knowledge and maintain their achievement. From this point of view, this might be due to follow-up education is most essential to continuously upgrade their knowledge; this could be in the form of equipping them with booklet, and workshops and boosting their knowledge and practices regularly.

Conclusion:

In light of the results of the current study, it can be concluded that the study revealed that the training sessions were effective in increasing the level of caregivers' knowledge and practices of diabetes management.

Recommendations:

On the basis of the current study findings, the following recommendations are suggested:

1. As caregivers'' skills evolved through in-service training, their roles in diabetes must include greater independent practices regarding insulin, and continuing training sessions should be provided to all caregivers to update their knowledge and practices.
2. An illustrated booklet for maintaining knowledge and practices of the most important care needed for diabetes management should be available in all nursing homes.
3. Knowledge and good practicing about care of diabetic foot are compulsory in recruiting caregivers dealing with elderly people.
4. Furthermore researches on wide scale to confirm study results.

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