

## Effect of Coaching Program on Prevention of Peripheral Neuropathy Deterioration among Patients with diabetes mellitus

Nagwa Mohamed Helmy<sup>(1)</sup>, Azza Anwar Aly<sup>(2)</sup>, Wafaa Hassan Ali Awad<sup>(3)</sup>, Mona Mohamed Abd El Hamid Younes<sup>(4)</sup>, Hanan Ali Ibrahim Almanzlawi<sup>(5)</sup>

(1) Lecturer of Medical-Surgical Nursing Faculty of Nursing Suez Canal University

(2) Assistant professor of Medical-Surgical Nursing faculty of Nursing Damanhour University, Associate professor of Medical-Surgical nursing Ibsina national college

(3) Assistant professor of Medical-Surgical Nursing Faculty Alexandria University, Associate professor of Medical-Surgical nursing Ibsina national college

(4) Lecturer of Community Health Nursing, Faculty of Nursing, Port Said University, Egypt

(5) Assistant professor of Medical-Surgical Nursing Department, Faculty of Nursing, Mansoura University

### Abstract

**Background:** Diabetic Peripheral Neuropathy (DPN) is a common complication of diabetes, which could lead to foot ulcers, amputations, and mortality among patients. **Aim:** to determine the effect of the coaching program on prevention of peripheral neuropathy deterioration among patients with diabetes mellitus. **Design:** a quasi-experimental design (pre/post-test) with experimental and control groups. **Setting:** The study was conducted at Diabetic Outpatient Clinic at Port-Said General Hospital. **Subjects:** A Purposive sample consisting of 100 patients was divided into experimental and control groups (50 patients in each) from the above-mentioned setting they were assigned randomly. **Tools:** Three tools were used for data collection, tool I structured interviewing questionnaires regarding patient assessment, tool II regarding clinical neurological examination scale; and tool III questionnaire about needs of patients with 'peripheral neuropathy deterioration. **Results:** The study finding revealed that 58% of the experimental group and 67% of the control group of studied patients have severe diabetic peripheral neuropathy on their right side. Pre implementing coaching program there were no statistically significant differences between patients in both groups related to their level of knowledge about the prevention of diabetic peripheral neuropathy deterioration ( $p > 0.05$ ). While there were significant differences post- implementation of the coaching program regarding level of knowledge between the control group and the experimental group regarding the educational needs about prevention of diabetic peripheral neuropathy deterioration. The level of knowledge was significantly higher among the experimental group than among the control group after implementing the coaching program with ( $p < 0.001$ ). **Conclusion:** A coaching program regarding the prevention of peripheral neuropathy deterioration had a positive effect on the level of knowledge among patients with diabetes mellitus. **Recommendations:** Continuous application of the coaching program for diabetic patients to improve their level of knowledge regarding the prevention needs of diabetic peripheral neuropathy deterioration stages.

**Keywords:** Coaching Program, diabetes mellitus, prevention of peripheral neuropathy deterioration.

### Introduction

Diabetic peripheral neuropathy (DPN), a frequent complication of diabetes mellitus, is described as "the presence of symptoms and/or evidence of peripheral nerve dysfunction in patients with diabetes mellitus following the exclusion of alternative causes." It could lead to foot ulcers, amputations, and patient mortality. Peripheral nerve injury is caused by long-term hyperglycemia and microvascular problems associated with diabetes mellitus, which reduces nourishment, particularly to the nerves in the foot (Mirghani et al., 2021).

Accordingly, it is anticipated that the prevalence of peripheral neuropathy will rise. Approximately one-third of patients with diabetes mellitus have DPN, according to statistics from around the world. International prevalence surveys indicate that about 87% of instances, DPN is the primary cause of diabetic foot. Studies conducted in Egypt match the figures from studies conducted abroad. Most occurrences of diabetic foot complications nearby clinics are brought on by DPN (Kisozi et al., 2017; Amara et al., 2019 & Aldana et al., 2021)

Clinical risk factors for DPN include metabolic alterations, elevated levels of total and low-density lipoprotein cholesterol and

triglycerides, prolonged duration of diabetes, elevated body mass index, elevated urinary albumin excretion rate, hypertension, and smoking (Kelkar, 2020; Secorn et al., 2021).

To provide a framework for diagnosis and care, a staging system for neuropathy has been devised. The following grades were assigned to it: no clinical neuropathy in stages 0 or 1. Stage 1: No symptoms or signs; Stage 2: Clinical neuropathy (chronic painful, acute painful, painless with complete/partial sensory loss and diabetic amyotrophic); stage 3: Late complications of clinical neuropathy (foot lesions, such as ulcers; neuropathic deformity, such as charcot joint; and non-traumatic Amputation); (Yang et al., 2018).

Nurses play a basic and important role in reducing and preventing foot ulcers, lower limb amputations, and disabilities related to DPN complications through educational interventions for the patients and/or their families, this includes glycemic control, lifestyle modifications, physical exercise, reduce exposure to toxins and quit smoking, healthy diet, Stress management, and foot care. The safe provision of patient care in compliance with regional and national clinical guidelines is the duty of all health professionals involved in treating patients with DPN (Kassar & Khudur, 2021). According to most of the research, nurses must take a training course to advance their knowledge and provide them the chance to finish graduate-level coursework with educational sessions that will improve the nursing care they deliver to such group of patients (Hassan & Aburaghif., 2016).

Coaching is one of the few choices available to help promote the development of professional (Mohamed & Elsisi., 2018). This is beneficial to learners, recent graduates, and practitioner nurses. This strategy is a sort of support for people who want to realize their full potential, set goals and ways to achieve them, as well as advance their knowledge and abilities. Nurses can strengthen their current knowledge and gain new skills through coaching. The atmosphere that coaches create fosters the development of knowledge and skills among the learners (International Coach Federation, 2018).

#### Significance of the study:

Diabetic peripheral neuropathy affects 10–50% of people with Diabetes Mellitus (Burgess et al., 2021). The prevalence of DPN in Egyptian among patients with diabetes mellitus according to the national data is 29.3%. In various populations, the global estimates DPN prevalence range substantially from 9.6 to 88.7% (Amara et al., 2019 & Aldana et al., 2021). DPN is a disease that could be avoided by raising awareness of glycemic control. The ability to deliberately organize professional development based on the demands and expectations provided by the patients through coaching (Lee & Oh, 2018). Therefore, in the current study, the researchers aimed to determine the effect of a coaching program on prevention of peripheral neuropathy deterioration among patients with diabetes mellitus.

#### Aim of the study

This study aimed to determine the effect of a coaching program on prevention of peripheral neuropathy deterioration among patients with diabetes mellitus.

#### Research hypothesis:

Coaching program expected to have positive effect on patients with diabetes mellitus knowledge level regarding the prevention of peripheral neuropathy deterioration post-program implementation.

#### Subjects and Methods:

##### Research design:

A quasi-experimental design (pre/post-test) with experimental and control groups was used in this study.

##### Setting:

The study was conducted at Diabetic Outpatient Clinic at Port-Said University Hospital. It provided diagnostic and therapeutic services for diabetic patients from Saturday to Wednesday, from 9 a.m. to 1 p.m. These settings were selected due to higher diabetic patients attendance rate; serving the biggest region of the population from rural and urban regions and also, providing free services to diabetic patients who are resident in Port-Said city.

**Sample:**

A Purposive sample consisting of 100 diabetic patients divided into experimental and control groups (50 patients each) recruited randomly from the above-mentioned setting.

**Inclusion criteria:**

All patients' age ranges from 18- 60 years, male and female who were diagnosed with type 1 DM, and stage 2 diabetic peripheral neuropathy and were willing to participate in the study.

**Exclusion criteria:**

Type 2 DM, stage 0/1 & 3 of diabetic peripheral neuropathy, neuropathy due to trauma or malignancy.

**Sample size:**

The researchers used the following formula to determine the effect sample size for this study: significance level [ $\alpha$ ] =.05, power [ $1-\beta$ ] =.90, effect size [ $d$ ] =.90 with the independent-sample t-test, using the G\* Power tool. In each group, there was a minimum reported sample size of 49. However, based on the dataset and assuming a dropout rate of 25–35%, the researchers found that the experimental group would need at least 50 individuals.

**Tools:**

Three tools used for data collection

**Tool I: Patient assessment sheet:** - It developed by the researcher based on national and international literature review. It consisted of two parts:

**Part1: Patients' demographic data;** It included patients' age, gender, residence, working status, and educational level.

**Part 2: Health history;** It was adopted from (Burgess et al., 2021; & Aldana et al., 2021). It assessed the current and past health history of studied patients such as Diabetes duration, treatment plan, smoking, presence of co- morbid condition ...etc.

**Tool II: Clinical neurological examination scale (CNE);** This scale assesses sensory signals and reflexes in the lower limbs, is

a clinical scoring system that used to determine the severity of DPN. It was adopted from Yang et al., (2018). It is a clinical examination of the sensory dysfunction of the feet's pinprick, light touch, vibration, and position sense, the anatomic level beyond which light touch sensibility is impaired, the strength of the feet's muscles, and the ankle reflexes are all part of this process.

**Scoring system:**

The CNE earned a total of 33 points. One to nine (1:9) is rated as mild, 10:18 is rated as moderate, and 19:33 is rated as severe DPN. A score of zero is rated as having no neuropathy. Lab tests and diagnostic studies are covered in Part 4. This section comprised diagnostic tests and laboratory investigations, such as HbA1c value, complete lipid profile, blood sugar level, CBC, etc.).

**Tool III: Peripheral neuropathy deterioration' patients' needs questionnaire sheet.**

This tool was designed by the researcher based on an analysis of the national and international literature (Amara et al., 2019; Burgess et al., 2021; & Aldana et al., 2021) to evaluate the patients' educational needs regarding the prevention of DPN deterioration. It included objective and essay questions about the following topics: the disease process, glycemic control, a healthy diet, exercise, and foot care.

**Scoring system:**

Patients who received scores of >70% were seen as having a high level of knowledge, while those who received scores of 50% to 70% were regarded as having a moderate level of knowledge. The sum of the questions' scores was converted into high-level, moderate-level, and low-level outcomes. While those who received a score of less than 50% were scored as having low knowledge level.

**Procedures:**

This study was carried out in three phases:  
**Preparatory phase:**

It involved analyzing the relevant material from the past and present, as well as theoretical understanding of many study-related issues using books, papers, the internet, periodicals, and magazines to create

data-gathering tools (Saltar & Sahar, 2020 and Ziegler et al., 2021) The total number of the sample under study (10patients). There were 50 patients in the experimental group and another 50 in the control group. Before the coaching program was put into place, the researchers started by conducting individual interviews with each patient, which took about 20 to 30 minutes. This was done to find out how effective the coaching program was at preventing diabetic patients' peripheral neuropathy from getting worse.

#### **Content validity and reliability:**

It was developed by a panel of five experts (three professors of medical surgical nursing from the nursing school and two professors of vascular surgery from the medical school), who examined the tool for clarity, relevance, comprehensiveness, understanding, applicability, and ease. Cornbrash's alpha coefficient was used to gauge the tools' dependability; it was (0.824).

#### **Pilot Study:**

A pilot study was conducted on 10% of patients (10 patients) to evaluate the clarity, feasibility, and applicability of the tools. The data obtained from the pilot study were analyzed. There was no change. Patients who participated in the pilot study were included in the main study.

#### **Ethical Consideration:**

The ethical committee of the Faculty of Nursing granted permission for the study to be conducted. A formal letter was sent to the head of the department of vascular surgery by the dean of the nursing school at Port-Said University to gather the required information. Nursing personnel and surgeons were informed of the study's purpose to secure their involvement. Additionally, after being informed of the study's nature and objectives, patients who were interested in participating verbally consented. Privacy and secrecy were guaranteed. At any moment, patients had the right to reject to take part in the study and/or to leave it without giving a reason.

#### **Implementation phase:**

The period from January 2022 to June 2022 data was collected, before any data was collected, the researcher greeted and introduced herself to the patients and went through the study's objectives with those who decided to

participate. Interviewing provided the tools. Two days every week from 9 am to 1 pm were dedicated to the researcher's attendance. A clinical neurological examination, health history, and demographic information were all collected from each patient with diabetes mellitus. With the help of tool III, each patient's educational requirements about DPN deterioration prevention were also evaluated.

When applying for a coaching program: At this point, researchers employ the GROW modeling method (Whitmore, 2002). The GROW model of coaching strategy is the most popular (Goal, Reality, Options, Will). The GROW model uses a cooperative problem-solving procedure that entails determining the source of the issue, coming up with a solution, and putting it into practice. This model is regarded as a straightforward and practical method that focuses on coaches' actions as they assist clients in reaching their objectives and resolving issues during the coaching process. There are four stages:

1. G for Goal: The patients' desired outcome is the goal, which should be as well specified as possible.
2. R for Reality, patients describe their current circumstances and how far they are from their objectives at this stage.
3. O for options and barriers: What hurdles (barriers) stand in the way of patients accomplishing the objective? The helper can discover solutions and ideas once these obstacles have been identified.
4. W for the will to move forward: After options are chosen, they must be transformed into actions that nurses can take to reach the objective.
5. All patients in the experimental group participated in a group coaching program that consisted of 8 sessions, including group discussions and telephone or individualized coaching sessions, during the experimental intervention. The experimental group received the curriculum in accordance with the GROW coaching paradigm. The coaching program's initial session was focused on the subject that the patients did not grasp or on which there was insufficient information.

Before the start of education on a particular topic, such as DPN deterioration prevention, the researchers established and confirmed detailed goals the subjects wanted to achieve in each subject in phase G (goal setting), such as the definition of DPN deterioration, disease process, the incidence of DPN deterioration, list clinical manifestations of DPN deterioration, risk factors for DPN deterioration, treatment of DPN deterioration, glycemic control, healthy diet.

In the R (Reality) stage, the researchers used framing questions to identify the challenges and barriers to applying the subject of "care guidelines for patients with DPN deterioration."

In the O (options) stage, the researchers encouraged learning by outlining what participants needed to know and accomplish for each program issue. They also set up coaching sessions based on participant needs and the most recent recommendations for treating patients with DPN deterioration.

In the last W (will) step, the researchers validated the information and urged participants to confidently implement coaching in their workplaces. There are no pre-made answers offered by the coach during the coaching process. While the coach supports the participant throughout the entire process by paying close attention to what they have to say and by posing open-ended questions that are meant to assist them to come up with the best plan for achieving the specified objective in the light of their resources.

To help the experimental group's expertise, the researchers provide training sessions. The training's main focus was on teaching participants how to prevent DPN from worsening. Sessions related to the coaching program, too. Face-to-face encounters are how the coaching sessions are conducted.

#### **Evaluation phase:**

At the end of the coaching program sessions, the researchers begin to evaluate the training, and determine the effect of the coaching program regarding the prevention of peripheral neuropathy deterioration among. Before the coaching program was put into place, the researchers started by conducting

individual interviews with each patient, which took about 20 to 30 minutes. This was done to find out how effective the coaching program could prevent peripheral neuropathy from getting worse among patients with diabetes Mellitus using the same pre-test tools. The control group received no coaching sessions.

#### **Statistical analysis:**

Computers were used to edit, code, and enter the data that were acquired from the analyzed sample (PC). Statistical Package for Social Sciences (SPSS) version 22 was utilized for computerized data entry and statistical analysis. Frequencies, percentages, and Mean SD were used to present data using descriptive statistics. A correlation coefficient, often known as a "Pearson correlation," is a metric used to express several types of connections or a statistical relationship between two variables.  $P < 0.05$  served as the threshold for statistical significance. For examining correlations between categorical data, the Chi-Square test statistic is frequently employed.

#### **Results:**

**Table (1):** demonstrated that the experimental group's mean age was 54.33 +/- 7.00 years old and the control group's mean age was 56.02 +/- 8.32 years old. In addition, 63% of the patients in the control group and 58% of the experimental groups were men. Urban areas make up 62% of the experimental group's residency, compared to 64% among the control group. In the experimental group and the control group, respectively, more than one-third of them (38% and 37) have a secondary education.

**Figure (1):** This figure revealed that all of the patients (100%) of the experimental group and the control group, respectively, did not receive training related to the prevention of peripheral neuropathy deterioration among. Before the coaching program was put into place, the researchers started by conducting individual interviews with each patient, which took about 20 to 30 minutes. This was done to find out how effective the coaching program could prevent peripheral neuropathy from getting worse among patients with diabetes mellitus.

**Table (2):** demonstrated that the experimental group's mean diabetes duration was 45.91 +/- 7.13 years, compared to the control

group's 46.51 7.12 years. Additionally, 52% of the study subjects in the control group and (48%) among the experimental groups were overweight. Moreover, half of them (56%) in the experimental group and (52%) in the control group have the right side impacted, respectively. In the experimental group and control group, respectively, nearly two-thirds of them (54% and 60%) were not smoker. Additionally, in the experimental group and control group, hypertension affects 71% and 72% of the participants, respectively, and the cardiovascular disease affects 58% and 54% of the participants in the experimental group and control group, respectively.

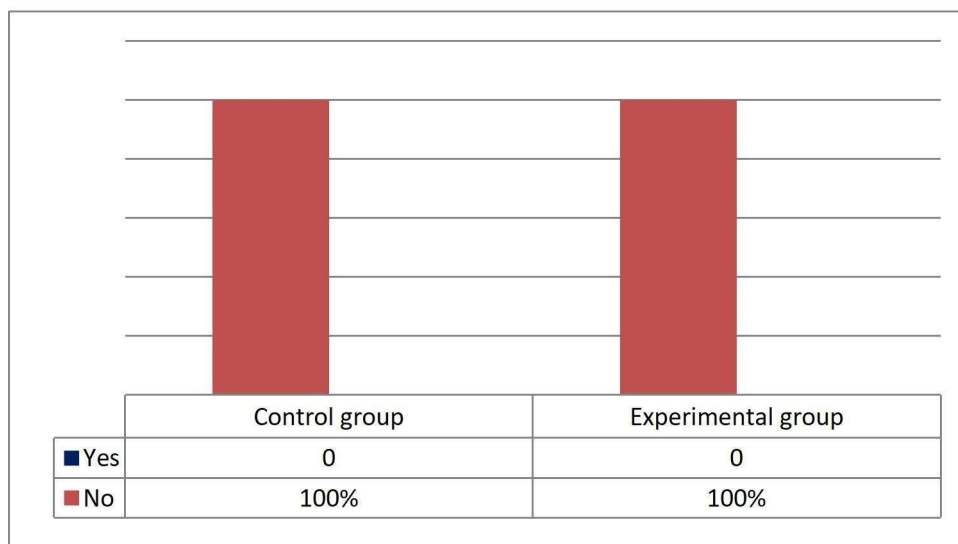
**Figure (2):** reveals that 58% of patients in the experimental group and 67% of patients in the control group have severe diabetic peripheral neuropathy on their right sides, while 65% of patients in the experimental group have moderate diabetic peripheral neuropathy in their left sides, compared to 54% of patients in the control group.

**Table (3):** explains that before the coaching program, there were no statistically significant differences between patients in the control and experimental groups in terms of their level of knowledge about the educational requirements for preventing the progression of diabetic peripheral neuropathy with ( $p > 0.05$ ). While there were significant differences in post-knowledge scores between the control group's (17%; 14%) high level of knowledge before coaching and the experimental group's (30.0%; 66%) post-coaching program concerning educational needs that related to prevent the progression of diabetic peripheral neuropathy, respectively. After the coaching program intervention, the Knowledge values in the experimental group were noticeably higher than among the control group with ( $p < 0.001$ ).

**Table (4):** showed that the experimental group that participated in the coaching program experienced a statistically significant rise in their overall level of knowledge that related to prevention of diabetic peripheral neuropathy deterioration with  $t=3.94$  at  $p < 0.001$ .

**Table (1):** Frequency and percentage distribution of the studied patients in the experimental and control groups) regarding their demographic characteristics (n=100)

Demographic characteristic	Experimental (n=50)	Control (n=50)
	No (%)	No (%)
<b>Age (years )</b>		
30-<40	4(8.0)	6(12.0)
40-<50	6(12.0)	6(12.0)
50-<60	10(20.0)	12(24.0)
≥60	30(60.0)	26(52.0)
<b>Mean ± SD</b>	54.33±7.00	56.02±8.32
<b>Gender</b>		
Male	29(58.0)	31(62.0)
Female	21(42.0)	19(38.0)
<b>Residence</b>		
Urban	31(62.0)	32(64.0)
Rural	19(38.0)	18(36.0)
<b>Education level (years)</b>		
Uneducated	10(20.0)	8(16.0)
Read and write	14(28.0)	12(24.0)
Primary educated	4(8.0)	6(12.0)
Secondary education	20(40.0)	20(40.0)
University education and above	2(4.0)	4(8.0)
<b>Previous Attending Training prevention of peripheral neuropathy deterioration among patients with Diabetes Mellitus</b>		
Yes	0(0.0)	0(0.0)
No	50(100.0)	50(100.0)

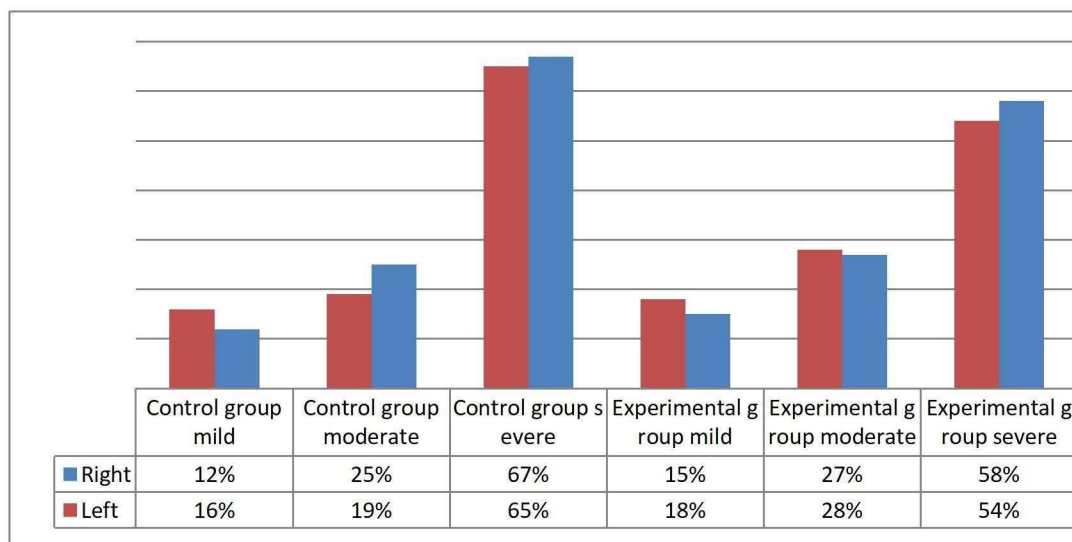


**Figure (1):** Percentage distribution of the studied patients among the experimental and control groups) regarding previous Attending Training prevention of peripheral neuropathy deterioration among patients with Diabetes Mellitus (n=100)

**Table (2):** Frequency and percentage distribution of the studied patients among the experimental and control groups regarding their current and past health history (n=100)

Items	Experimental (n=50)	Control (n=50)
	No (%)	No (%)
<b>Diabetes duration</b>		
20-<40	10(20.0)	13(26.0)
40-<60	32(64.0)	31(62.0)
≥60	8(16.0)	6(12.0)
Mean x S.D	45.91±7.13	46.51±7.12
<b>Body mass index/ Weight status</b>		
Normal	14(28.0)	12(24.0)
Overweight	24(48.0)	26(52.0)
Obese	12(24.0)	12(24.0)
<b>Affected side</b>		
Right side	28(56.0)	26(52.0)
Left side	20(40.0)	19(38.0)
Bilateral	2(4.0)	5(10.0)
<b>Smoking history</b>		
Current smoker	11(22.0)	13(26.0)
Quit smoking	9(18.0)	7(14.0)
Never smoked	27(54.0)	30(60.0)
<b>*Comorbid conditions</b>		
Hypertension	35(70.0)	36(72.0)
Cardiovascular disease	29(58.0)	27(54.0)
Dyslipidemia	13(26.0)	19(38.0)
Nephropathy	4(8.0)	3(6.0)
Retinopathy	5(10.0)	4(8.0)

\*More than one answer



**Figure (2):** Percentage distribution of the studied patients among the experimental and control groups according to the severity of diabetic peripheral neuropathy (n=100)

**Table (3):** Frequency and percentage distribution of the studied patients according to their educational needs about diabetic peripheral neuropathy deterioration prevention among the control and the experimental groups' pre-post coaching program

Educational needs about DPN	Pre-coaching						P-value	Post-coaching						P-Value
	Control			Experimental				Control			Experimental			
	High %	Moderate %	Low %	High %	Moderate %	Low %		High %	Moderate %	Low %	High %	Moderate %	Low %	
Disease process	10.0	20.0	70.0	12.0	22.0	66.0	0.23	14.0	26.0	70.0	64.0	20.0	16.0	.001*
glycemic control	17.0	23.0	60.0	26.0	18.0	56.0	0.49	30.0	20.0	50.0	70.0	10.0	20.0	.001*
Healthy diet and exercise	20.0	25.0	45.0	32.0	24.0	44.0	0.19	34.0	24.0	42.0	72.0	22.0	6.0	.001*
Foot care	26.0	20.0	54.0	18.0	26.0	66.0	0.41	32.0	30.0	38.0	60.0	26.0	14.0	.001*
Total knowledge	17.0	23.0	60.0	14.0	23.0	63.0	0.53	30.0	20.0	50.0	66.0	20.0	14.0	.001*

The Chi-square test was used; highly significant at < .001

**Table (4):** Mean and SD of total patient knowledge regarding diabetic peripheral neuropathy deterioration prevention among the control and the experimental group's pre-post coaching program (n=100).

Variables	Group	Control (n=50)	Experimental (n=50)	t-test	p-value
		M±SD	M±SD		
Total Knowledge about diabetic peripheral neuropathy deterioration prevention	Pre	7.56±1.38	6.20±1.22	1.88	.034
	Post	9.22±2.23	17.64±3.3	4.78	.001*

t-test was used \*highly significant at < .001

**Discussion:**

Diabetes complications such as diabetic peripheral neuropathy (DPN), which has a wide range of clinical presentations and could cause foot ulcers, amputations, and mortality among patients with diabetes mellitus, are prevalent

(Hamme et al., 2020 & Mirghani et al., 2021).

The current study's analysis the demographics data of the investigated patients revealed that the experimental group's mean age was 54.33 +/- 7.00 years old and the control



group's mean age was 56.02 +/- 8.32 years old.

According to the study, diabetes is a degenerative disease that steadily develops as individuals become older, leading to difficulties for patients who have had the disease for a long time. A study done by **Kisozi et al. (2017)**, they examined the prevalence, severity, and risk factors for peripheral neuropathy among newly diagnosed patients with diabetes mellitus who visited Mulago Hospital, and reported that the mean age for DPN was 54.1 years old. These findings conflict with their findings. Furthermore, according to **Hamme et al., (2020)** who investigated the "Electrophysiologically verified benefits of acupuncture on diabetic peripheral neuropathy in type 2 diabetes," the average participant age was between seventy and seventy-two years old.

More than three-thirds of the patients in the control group and almost three-thirds of the experimental groups, respectively, were found to be male, according to the current study's findings on gender. This finding may be attributed to women's propensity to seek medical care more frequently than men, which aids in the early identification and prevention of diabetic complications. This conclusion is supported by Barbara et al., primary's findings from their study, title "Risk Factors for Diabetic Peripheral Neuropathy and Cardiovascular Autonomic Neuropathy in Diabetes," which discovered that more than half of the investigations conducted on males. However, the results are at odds with the primary research done by **(Metin & Arslan, 2018)**, who investigated "Diabetic peripheral neuropathic pain from the perspective of turkish patients." and **Jorgetto et al., (2021)** who carried out a study title "diabetes foot assessment of diabetic peripheral neuropathy patients and associated factors to plantar pressure alterations and discovered that more than half of the cases under study were females.

The current study discovered that nearly three-thirds of the experimental groups were males and more than three-fifths of the patients in the control group were men. According to patient's residence more than three-fifths are from the urban area in the experimental group compared to more than three-fifths in the control group. As regards their educational level, two-fifths of them have secondary education among

the experimental group and the control group, as well.

Nearly two-thirds of them are from urban areas in terms of their place of residence. This result may be the cause of the undesirable habits among this community, such as inactivity and walking, which raise the risk of exposure to obesity and complications from D.M. This result was consistent with **(Kisozi et al., 2017)**, who reported that more than two-thirds of patients with diabetes mellitus were from urban dwellers.

Over one-third of the patients in the study had at least a secondary education, according to the current study's findings on educational attainment. This might be because of the low likelihood of holding public office and the expensive price of a university education, which makes them not having the desire to complete a degree program. This finding was not comparable with numerous studies done by **Kisozi et al., (2017)** and **Jorgetto et al., (2021)**, in which they discovered that more than half of the study participants had only completed elementary school. Furthermore, the results of this study did not in agreement with those of **Metin & Arslan's (2018)** study, in which they revealed that more than one-third of the patients under examination had only completed elementary school.

The results of the current study showed that none of the patients in the experimental group or the control group, respectively, received training to prevent the progression of peripheral neuropathy among patients with diabetes mellitus. From the perspective of the researchers, it showed the root of the lack of knowledge regarding the prevention of diabetic peripheral neuropathy.

According to diabetes duration, the current study found that the experimental group's mean diabetes duration was 45.917.13 years while the control groups were 46.517.12 years. So, they were tied to the long-term damaging effects of diabetes on the peripheral nerve in the lower limb, this finding may be explained. This could be explained by the lengthening of diabetes, which accelerates the process of degeneration, damages nerve cells, alters both large and tiny nerve fibers, and makes elderly people more susceptible to neuropathy. These findings are corroborated by **Pfannkuche et al., (2020)** in study title, "Prevalence and risk factors of diabetic peripheral neuropathy in diabetics," which discovered that

type I Diabetes Mellitus had a higher prevalence of DPN than other types of diabetes, especially after five years of diagnosis. The study done by **Sallam and Edison (2019)** examined the "Effect of nursing instructions on diabetic patients' knowledge about peripheral neuropathy and foot care," in which they found that less than half of the patients had Diabetes Mellitus for more than ten years. On the other hand, these findings are inconsistent with that study (5 – 10 years).

More than half of the study participants are overweight based on their BMI. This could be a result of the study participants' inactivity and poor eating habits. **Sallam & Edison's (2019)** their study result were concurred with our findings, where backed by the fact that more than half of the study group had high body mass indices (BMI).

The current study's findings regarding smoking history showed that, less than a quarter of the study's participants are currently smokers, and two-thirds of them had never smoked. The researcher explained that these findings could be due to that the smoker groups' had insufficient knowledge about the negative effects of smoking on glycemic control. Due to the damaging effects, on the peripheral nerves, smoking is a significant factor in the incidence of DPN. This result was in line with **Sallam & Edison's (2019)** who claim that the majority of the patients under study had never smoked.

Nearly 75 percent of the participants in the study have a comorbid condition as hypertension, and more than 50 percent of them have cardiovascular disease. According to the researcher point of view, these findings could be the result of a complex network of pathways connecting neuron function and energy generation with a defective neural vascular supply caused by hypertension and cardiovascular disease.

Regarding clinical neurological examination scores, it reveals that nearly three-thirds of studied patients in the experimental group and more than three-fifths in the control group among the studied patients have severe diabetic peripheral neuropathy on their right side, while more than three-fifths of them in the experimental group have moderate diabetic peripheral neuropathy in their left side compared to more than half in the control group among the studied patients.

According to (**Amelia et al., 2019**) who conducted a study about "diabetic neuropathy among type 2 diabetes mellitus patients at Amplas Primary Health Care in Medan City," and reported that more than one-third of the patients were found with normal neuropathy, less than half had mild neuropathy, and less than a quarter had moderate neuropathy.

The result revealed that in the pre-coaching program there were no statistically significant differences between patients in both groups the control and the experimental in relation to their level of knowledge about the educational needs that related to diabetic peripheral neuropathy deterioration prevention. While there were significant differences between the both groups post-program intervention regarding the knowledge scores as about three quarters had a high level of knowledge pre-coaching program while the experimental group showed decreased to one-third. While post-coaching program more than three-fifths their educational needs about diabetic peripheral neuropathy deterioration prevention increase. From the researchers' point of view, this difference might be clarified by the reality that coaching techniques could help patients in earning the essential knowledge to successfully manage and prevent the diabetic peripheral neuropathy

According to the study's findings, more than half of the patients become highly knowledgeable about the nature of their diseases. According to the researcher, more than half of them also have a high level of knowledge about glycemic management, while less than half have a moderate level of knowledge about a healthy diet and exercise routine, and less than a quarter have a low level of knowledge about foot care. This may be a result of patients' neglecting to visit the hospital-based diabetic education centers to get health information, to realize the effect of lack of regular medical care, or poor health-seeking behavior.

According to our findings, **Bauer et al., (2018)** investigated "Texting to improve disease management in patients with painful diabetic peripheral neuropathy" and support this conclusion as they reported that self-care activities related to diabetes, such as a healthy diet and blood glucose monitoring, as well as foot exams, are of relevant important to patients with DPN. The findings also pointed a bigger rise effect of self-care activity for foot exams. In a similar vein, **Secorn et al. (2021)** examined "Exercise and manual therapy for

diabetic peripheral neuropathy" and noticed that exercise, in all of its forms, had an advantageous for those group of patients who have diabetic neuropathy. Furthermore, the results of this study were in line with those of a study done by (Bhaskar et al., 2019), who examined "Assessment of knowledge and patient counseling to the patient with diabetes on diabetic foot care in tertiary care hospital" and discovered that more than one-quarter of participants had inadequate knowledge about diabetic foot care.

Additionally, the previous finding was reinforced by Yacout's (2016) in study title, "Knowledge and practices of type II diabetic patients' regarding diabetes," and found that fewer than half of the tested sample had adequate overall knowledge regarding the care of diabetic feet. The outcome is consistent with the findings of (Mohmed et al., 2018) who investigated "Home Care for Clients with Diabetic Peripheral Neuropathy" and found that providing health education to clients with diabetic peripheral neuropathy could help them gain knowledge and practices that will ultimately promote a healthy lifestyle and prevent complications.

Additionally, this finding is consistent with that of (Ren et al., 2014), who investigated the "Effect of intensive nursing education on the prevention of diabetic foot ulceration among patients with high-risk diabetic foot" and found that the intensive education could help patients focus on managing of their diabetes and was helpful for the prevention and treatment of risk factors for diabetic foot diseases, including plasma glucose, blood lipids, blood pressure, and other conditions that have indirect effects on the development of diabetic foot diseases. Patient's blood pressure, fasting blood glucose, and HbA1c levels all considerably fell after receiving intense nursing education, and their high-density lipoprotein cholesterol levels improved even more than they had before.

On the other hand, the results of study done by (Sallam & Edison, 2019) are inconsistent with our findings because they claimed that the total knowledge about foot care among the studied group revealed that while none of the studied samples had a satisfactory level of knowledge about foot care before the intervention, the majority did so one week after intervention and three months later.

The results of the current study showed that there were strong positive relationships between all of the total dimensions indicated in terms of peripheral neuropathy nursing educational needs. According to the researcher, this result may be because patient awareness about the disease process could raise patient awareness regarding glycemic management, eat a healthy diet, exercise, and foot care. This result was equivalent to that of Sallam & Edison (2019) who showed a highly statistically significant improvement among patients' understanding of diabetic peripheral neuropathy across all knowledge items after one week and three months of intervention.

This argument is consistent with that of Mohmed et al. (2018), who noticed that the majority of the study sample had inadequate knowledge before program implementation, whereas after program implementation, most of the participant had satisfactory knowledge. The positive correlation between the foot-care knowledge scores and behavior scores are suspected as it confirm the importance of foot-care education as improving knowledge level is the first step in improving foot-care practice among our patients, similar to some previous studies done by Mahdi & Hasan (2011) in title "Foot care knowledge and practice among diabetic patients attending primary health care centers in Jeddah City."

The current study revealed that the experimental group who received the coaching program showed a statistically significant increase in their total level of knowledge about diabetic peripheral neuropathy deterioration prevention. This finding may be attributable to that the coaching program helped patients update and improve their knowledge.

### **Conclusion:**

Based on the findings of the current study, it was concluded that the coaching program had a positive effect on knowledge level among patient with Diabetes Mellitus regarding needs to know about the prevention of peripheral neuropathy deterioration.

### **Recommendations:**

The following recommendations are suggested in light of the study findings:

- Ongoing patient coaching program should be developed to help patients learn more about the need to avoid DPN phases from deteriorating.
- It is crucial to educate patients about DPN through in-service training sessions.
- A replication of the same study for data generalizability using a bigger probability sample is recommended in several places.

### References:

- Aldana, Y., Rimachi, V., Rosario, H. A., Yupanqui, M., Flores, M., Espinoza, R., Olivares, F.G., Nolasco, C., Ve'lez, F.Q., Mariños, C., Torres, I., Diaz, C., & Barrios, K.
- Amara, F., Hafez, S., Orabi, A., El Etriby, A., Abdel Rahim, A., Zakaria, A., Koura, F., Talaat, F., Gawish, H., Attia, I., Abdel Aziz, M. F., El Hefnawy, M., Kamar, M., Halawa, M.R., El-Sayed, M., El Kafrawy, N., Khalil, S.H., & Assaad, S.N. (2019): Review of diabetic polyneuropathy: pathogenesis, diagnosis, and management according to the consensus of Egyptian experts. *Current Diabetes Reviews* Vol (15), No (415): Pp. 340-345.
- Amelia, R., Wahyuni, S., & Yunanda. (2019): diabetic neuropathy among type 2 diabetes mellitus patients at amplas primary health care in medan city. *Open Access Macedonian Journal of Medical Sciences*, Pp. 1-4 Available at <https://doi.org/10.3889/oamjms.2019.433> last accessed on July 2022.
- Barbara, H., Rose A., James W., Eval, F., Catherine L., Neil H., Trevor J., Maria, L., John M., & Rodica, P. (2020): Risk Factors for Diabetic Peripheral Neuropathy and Cardiovascular Autonomic Neuropathy in the Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications (DCCT/EDIC) Study, Vol (69): Pp. 1000-1010 Available
- Bauer, V., Goodman, N., Lapin, B., Cooley, C., Wang, E., Craig, L., Scott, E., Juhn, S., Cappelleri, C., Sadosky, B., & Masi, C. (2018): Text messaging to improve disease management in patients with painful diabetic peripheral neuropathy. DOI: 10.1177/0145721718767400. Last accessed on May 2022.
- Bhaskar, A. Reddy, K., Sagar, P., Kishore, K., Rao, M. & Krishna, V. (2019): Assessment of knowledge and patient counseling to the patient with diabetes on diabetic foot care in tertiary care hospital. *Int J Diabetol Vasc Dis Res*, Vol (7), No (1): Pp. 223-242 Available at <https://scidoc.org/IJDVR.php>. Last accessed on June 2022. DOI: 10.2174/1573399815666190226150402.
- Burgess, J., Frank, B., Marshall, A., Khalil, S. R., Ponirakis, G., Petropoulos, N., Cuthbertson, J., Malik, A., & Alam, U. (2021): Early detection of diabetic peripheral neuropathy: a focus on small nerve fibers. Available at <https://doi.org/10.3390/diagnostics11020165> <https://www.mdpi.com/journal/diagnostics>.
- Hamme, M., Friedemann, T., & Green, J. (2020): Electrophysiologically verified effects of acupuncture on diabetic peripheral neuropathy in type 2 diabetes: The randomized, partially double-blinded, controlled ACUDIN trial. *Journal of Diabetes*, No (13): Pp. 469-481. DOI: 10.1111/1753-0407.13130. Available at [wileyonlinelibrary.com/journal/jdb](http://wileyonlinelibrary.com/journal/jdb). Last accessed on May 2022.
- Hassan, N., & Aburaghif, L. (2016): Effectiveness of an Educational Program on Nurse's knowledge concerning Complications of Cardiac Catheterization among Children at Al-Nassirhya Heart Center. *KUFA journal for nursing science*, 6 (3), 243-245.
- International Coach Federation. (2018): Available from: <https://icf.org.pl/coaching/>. [cited 2022 August 10].
- Jorgetto, V., Oggiam, S., Gamba, A. & Kusahara, M. (2021): diabetic foot assessment of people with diabetic peripheral neuropathy and associated factors to plantar pressure changes. DOI: <https://doi.org/10.21203/rs.3.rs-613868/v1>. Last accessed on May 2022
- Kassar, A. & Khudur, M. (2021): Evaluation of nurses' practices regards diabetic foot care management at teaching hospitals in al-nasiriya city. *Kufa Journal for Nursing Sciences*, Vol (11), No (1).

- Kelkar, S. (2020): Diabetic Neuropathy and Clinical Practice. Available at <https://doi.org/10.1007/978-981-15-2417-2>. Last accessed on May 2022.
- Kisozi, T., Mutebi. E., Kisekka. M., Lhato S., Sajatovic. M., Kaddumukasa. M., Nakwagala. N. & Katabira. E. (2017): Prevalence, severity, and factors associated with peripheral neuropathy among newly diagnosed diabetic patients attending Mulago hospital: a cross-sectional study. *Afri Health*, Vol (17), No (2): Pp 463-473 DOI: <https://dx.doi.org/10.4314/ahs.v17i2.21>.
- Mahdi, A. & Hasan, A. (2011): Foot care knowledge and practice among diabetic patients attending primary health care centers in Jeddah City. *Chair for Diabetic Foot Research*, Vol (18), N (2): Pp. 55-71. DOI: 10.4197/Med.18-2.5.
- Metin, G. & Arslan, E. (2018): Diabetic peripheral neuropathic pain from the perspective of turkish patients: a qualitative study. *Journal of Transcultural Nursing*, Vol (29), No (6): Pp 514-
- Mirghani, O., Alanazi, K., Albalawi, M., Almalki, S., Alshehri, W., & Alonize, K. (2021): Restless leg syndrome and diabetic neuropathy: a case-control study among diabetic patients in tabuk, KSA, Vol (12), No (3): Pp. 12-17. Available at <https://doi.org/10.51847/KXu8SRIHt6>. Last accessed on May 2022.
- Mohmed, A., & Elsis, M. (2018). Effect of Nursing Guidelines for Nurses on Occurrence of Selected Post Therapeutic Cardiac Catheterization Complications among Children. *The Medical Journal of Cairo University*, 86(6), 2127–2139. <https://doi.org/10.21608/mjcu.2018.57138>.
- Mohmed, G., El-Guindi, K. & Esmat, M. (2018): Home Care for Clients with Diabetic Peripheral Neuropathy. *Egyptian Journal of Health Care*, Vol (9). No. (4)
- Pfannkuche, A., Alhajjar, A., Ming, A., Walter, I., Piehler, C., & Mertens, P. (2020): Prevalence and risk factors of diabetic peripheral neuropathy in a diabetics cohort: Register initiative “diabetes and nerves”. *Endocrine and Metabolic Science*, Available at [www.elsevier.com/locate/endmts](http://www.elsevier.com/locate/endmts) Endocrine and Metabolic Science 1 (2020) 100053 Contents list available at ScienceDirect. Last accessed on May 2022.
- Ren, M., Yang, C., Lin, Z., Xiao, S., MAI, F., Guo, C., & Yan, L. (2014): Effect of intensive nursing education on the prevention of diabetic foot ulceration among patients with the high-risk diabetic foot: a follow-up analysis, Vol (16), N(9), DOI: 10.1089/dia.2014.0004.
- Sallam, A. & Edison, S. (2019): Effect of nursing instructions on diabetic patients’ knowledge about peripheral neuropathy and foot care. *American Journal of Nursing Research*, Vol (7), No (4): Pp. 626-632, DOI: 10.12691. Available at <http://pubs.sciepub.com/ajnr/7/4/23> Published by Science and Education Publishing. Last accessed on June 2022.
- Sallam, A. & Edison, S. (2019): Effect of nursing instructions on diabetic patients’ knowledge about peripheral neuropathy and foot care. *American Journal of Nursing Research*, Vol (7), No (4): Pp. 626-632, DOI: 10.12691. Available at <http://pubs.sciepub.com/ajnr/7/4/23> Published by Science and Education Publishing. Last accessed on June 2022.
- Salzar, L., & Sahar, J. (2020): Effects of physical exercises on peripheral neuropathy sensation in patients with type 2. *Asian Community Health Nurses Research*, Vol (2), No (2): Pp. 11–21. Available at:
- Secorún, H., Peracho, V., Gonzalvo, M., Toro, C., Julián, Uriarte, T., Sanz, R., López, O., Moreno, M., & García, H. (2021): Exercise and manual therapy for diabetic peripheral neuropathy: a systematic review. Available at <https://doi.org/10.3390/app11125665> <https://www.mdpi.com/journal/applsci>. Last accessed on May 2022.
- Secorún, H., Peracho, V., Gonzalvo, M., Toro, C., Julián, Uriarte, T., Sanz, R., López, O., Moreno, M., & García, H. (2021): Exercise and manual therapy for diabetic peripheral neuropathy: a systematic review. Available at <https://doi.org/10.3390/>

app11125665 [https:// www. mdpi. com/ journal/ applsci](https://www.mdpi.com/journal/applsci). Last accessed on May 2022.

- Whitmore, J. (2002): Coaching for performance: Growing people, performance and purpose. 3rd ed. London: Nicholas Brealey Publishing;78-123.
- Yacout, A. (2016): Knowledge and practices of type II diabetic patients regarding diabetes. Foot Self-Care and Their Foot Disorders, Vol (12), No (1).
- Yang, Z., Zhang, Y., Chen, R., Huang, Y., Ji, L., Sun, F., Hong, T., & Zhan, S. (2018): Simple tests to screen for diabetic peripheral neuropathy. Cochrane Database of Systematic Reviews, No: CD010975.
- Ziegler, D., Tesfaye, S., Spallone, V., Gurieva, I., Al Kaabi, J., Mankovsky, B., Martinka, E., Radulian, Nguyen, K., Stirban, A., Tankova, T., Varkonyi, T., Freeman, R., Kempler, P., and Boulton, J. (2021): Screening, diagnosis, and management of diabetic sensorimotor polyneuropathy in clinical practice: International expert consensus recommendations. Diabetes Research and Clinical Practice, DOI: [https:// doi. org/ 10. 1016/ j. diabres. 2021. 109063](https://doi.org/10.1016/j.diabres.2021.109063).