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Effect of Nursing Instructions on Diabetic Patients' Knowledge about Peripheral Neuropathy and Foot Care

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Abstract Diabetic peripheral neuropathy occurs in about half of the diabetic patients and it increases the risk of foot problems. **Aim:** To assess the effect of nursing instructions on diabetic patients' Knowledge about peripheral neuropathy and foot care. **Research design:** A quasi experimental research design was used. **Sample**: purposive sample was used to select 60 adult diabetic patients. **Setting:** outpatient diabetic clinic at King Khalid Hospital, Hail in KSA. **Tools:-**Structured interview questionnaire was developed by the researchers to assess sociodemographic, medical data and Diabetic patient's knowledge about peripheral neuropathy and foot care. **Results**: There was a highly statistically significant improvement of the studied group total knowledge about diabetic peripheral neuropathy as well as about foot care after one week and after three months of intervention than pre intervention. **Conclusion**: Implementation of nursing instructions regarding peripheral neuropathy and foot care was effective in improving diabetic patients' knowledge about them. **Recommendations:** Applying nursing instructions regarding peripheral neuropathy and foot care with a large sample in different settings to enhance and confirm the current results.

Keywords: *nursing instructions, foot care, diabetic peripheral neuropathy*

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1. Introduction

Globally, according to the World Health Organization in 2016, there are 422 million adults suffer from Diabetes mellitus (DM) [1]. The World Health Organization (WHO) has reported that the rate of diabetes in Saudi Arabia is the second highest in the Middle East and the seventh in the world. Around 7 million of people are diabetic and 3 million are pre-diabetic [2]. Egypt statistics revealed that by year 2030, there will be 8.6 million adults with diabetes. Fifty percentages of lower limb amputations are due to Diabetic foot problems [3]. Diabetes is the leading cause of neuropathy and foot problems in the world. Neuropathy is the most common complication and greatest source of morbidity and mortality among people with diabetes mellitus [4]. The major morbidity associated with neuropathy is foot ulceration, the precursor of gangrene and limb loss. People with diabetes are at risk of nerve damage (neuropathy) and problems with the blood supply to their feet (ischemia) [5]. Both neuropathy and ischemia can lead to foot ulcer and slow healing of wounds. If they get infected may result in amputation [6]. The symptoms of diabetic neuropathy include paresthesia (prickling, tingling sensation) and burning sensations. As the neuropathy progress the feet become numb [7]. Diabetic neuropathy symptoms appear in the toes first and progress gradually to the feet and legs [8]. This is because the sensory nerves of the longest axons are firstly affected [9].

Worldwide Diabetic Peripheral Neuropathy (DPN) affect about 25-80% of persons with diabetes [10]. Hence early recognition of neurological dysfunction is therefore crucial in order to prevent foot complications. There are potentially preventable complications if neuropathy is diagnosed early [11]. Lack of awareness about peripheral neuropathy and foot examination increase the prevalence of peripheral neuropathy. Physicians were not examining the feet of their patients and hence were failing to detect foot related problems. The study conducted by [12] found that the people with diabetes didn't receive guidelines-recommended foot care, including regular foot examinations. Based on the review of literature and on the observation made by the investigators, the peripheral neuropathy is due to lack of knowledge about the complications of diabetes, poor follow up, screening of foot and lack of foot care. Managing diabetes requires a concerted effort on the part of the patient [13]. Management of chronic conditions such as diabetes requires engaging the individual to take an active role in self-care. Management of diabetic neuropathy can be achieved through control of hyperglycemia, good foot care and management of pain [14]. Nurses as one of the health

care workers should teach diabetic patients about regular foot self-examination and care [15].

1.1. Significant of the Study

There is an urgent need for providing instructional guidelines to improve the diabetic patients' Knowledge about peripheral neuropathy and foot care. Therefore, the researchers conducted this study which aimed to assess the effect of nursing instructions on diabetic patients' Knowledge about peripheral neuropathy and foot care hoping that this study will contribute to improve patients' Knowledge about peripheral neuropathy and foot care and minimize the occurrence of diabetic peripheral neuropathy and foot problems.

1.2. Aim of the Study

This study aimed to assess the effect of nursing instructions on diabetic patients' Knowledge about peripheral neuropathy and foot care.

1.3. Hypotheses

1. There will be a significant difference between the diabetic patients' knowledge about peripheral neuropathy pre and post intervention.
2. There will be a significant difference between the diabetic patients' knowledge about foot care pre and post intervention.

1.4. Operational Definition

Knowledge: In this study, knowledge refers to the right response scores obtained by type 2 diabetic patients to the structured knowledge questionnaire on peripheral neuropathy and foot care.

Diabetic peripheral neuropathy: In this study, it is a problem with the functioning of the nerves due to diabetes characterized by numbness, weakness and burning pain of arms, hand and feet.

2. Subjects and Methods

2.1. Research Design

The quasi experimental design was used.

2.2. Setting

The study was conducted in out-patient diabetic clinic of King Khalid Hospital, Hail city in KSA.

2.3. Sampling Technique and Sample Size

A sample of 60 adult diabetic patients was selected by purposive sampling technique.

-Inclusion criteria: Adult diabetic patients who were able to cooperate with the assessment and willing to participate in the study.

-Exclusion criteria: Patients with the history of neurological conditions such as stroke, hemi paresis, and hemiplegia and with dermatological problems like cellulites were excluded.

2.4. Data Collection Tools

- Structured interview questionnaire was developed by the researchers and included three parts

Part I: To assess sociodemographic and medical data as age, gender, level of education, years of diabetes, smoking, treatment, family history of disease, received advice about disease, Body Mass Index, level of blood sugar, etc.

Part II: To assess patients' knowledge about peripheral neuropathy with 12 questions related to definition, causes, signs and symptoms ,complications, treatment and prevention of peripheral neuropathy.

Part III: To assess patients' knowledge about foot care included 12 questions related to daily foot inspection and washing with warm water, drying between toes, applying lotion on foot, wearing socks, avoid heating pads on feet, not walking barefoot, use proper fitting shoes, checking shoes before wearing, not removing corn by self, cut foot nails straight, report any abnormal foot changes to doctor.

Scoring system for (part II and part III): Each correct answer was given a score of 1 and wrong answer a score of 0. The maximum score is 12 for either Knowledge about peripheral neuropathy or about foot care as categorized as follows; Score below 9 (75 %) is considered as unsatisfactory knowledge and score above 9 (75 %) is considered as satisfactory level of Knowledge.

2.5. Validity and Reliability

Content validity of the tools was established by giving it to 5 experts from Medical Surgical Nursing department. Using Cronbach's Alpha the tools were found to be reliable as indicated by the value of 0.825.

2.6. Pilot Study

Pilot study was conducted on 6 patients and revealed that it was feasible and appropriate to conduct the main study.

2.7. Ethical Considerations

An official permission was obtained from the directors and chief person of the hospital to conduct this study. The researchers explained the purpose of the study and their rights as study participants including anonymity, confidentiality, and their rights to withdraw from the study at any time. Informed consent was obtained from the patients who participated in the current study.

2.8. Data Collection Process

Phase I: The researchers introduced their selves to diabetic patients and explained the purpose of the study. An informed consent was taken from the study participants.

Phase II: Patients with diabetes waiting for their routine blood investigations were met and who met the inclusion criteria were interviewed for 20-30 minutes and conducted pretest using the tool then nursing instructions

about peripheral neuropathy and foot care with adequate explanation through using an information handout, demonstration and re demonstration were done by the researchers for each patient individually and handout was given to each patients. **Phase III**: post-test 1 was done after 7 days when the diabetic patients came to visit the physician using the same tool. **Phase IV:** post–test 2 was done after 3 months when the diabetic patients reported to the hospital for their follow up. The data was collected from the beginning of August 2018 to the end of January 2019.

2.9. Statistical Analysis

Data were collected, tabulated, statistically analyzed using an IBM personal computer with Statistical Package of Social Science (SPSS) version 22 (SPSS, Inc., Chicago, Illinois, USA).

a. Descriptive statistics: In which quantitative data were presented in the form of mean ($\overline{X}$), standard deviation (SD), range, and qualitative data were presented in the form numbers and percentages.
b. Analytical statistics: Used to find out the possible association between studied factors and the targeted disease. The used tests of significance included:

*Chi-square test ($\chi 2$): was used to study association between two qualitative variables.

*Fischer exact test for 2 x 2 tables when expected cell count of more than 25% of cases was less than 5 and p-value < 0.05 was considered significant.

* McNemar's test assess the significance of the difference between two correlated proportions, such as might be found in the case where the two proportions are based on the same sample of subjects or on matched-pair samples.

P value of >0.05 was considered statistically non-significant.

P value of <0.05 was considered statistically significant.

P value of <0.001 was considered statistically highly significant.

3. Results

Table 1. Socio demographic characteristics of the studied group (N =60)

Socio demographic characters		Studied group (N=60)	
		No.	%
Age / years	Mean ±SD	51.5±8.10	
	Range	29 - 78	
Gender	Male	24	40.0
	Female	36	60.0
Marital state	Married	53	88.3
	Single	7	11.7
Educational level	Illiterate	35	58.3
	Primary	12	20.0
	Secondary	9	15.0
	Higher	4	6.70
Occupation	Unemployed	45	75.0
	Employed	15	25.0
Habit of smoking	Yes	3	5.00
	No	54	90.0
	Passive	3	5.00

Table 1 showed that the mean age of the studied group was (51.5±8.10). Regarding gender, (60%) of studied group was female and (40%) was male. (88.3%) of the studied group was married and (58.3%) was illiterate. (75%) of the studied group was unemployed and (90%) of them was none smokers.

Table 2. Medical history among the studied group (N =60)

Medical history		Studied group n ==60	
		No.	%
Duration of diabetes	Less than five years	11	18.3
	5 – 10 years	28	46.7
	10 -15 years	18	30.0
	>20 years	3	5.00
Age of onset	Below 40	27	45.0
	40 – 50 years	30	50.0
	51 – 60 years	3	5.00
Family history of Diabetes	Yes	41	68.3
	No	19	31.7
History of HTN	Yes	33	55.0
	No	27	45.0
Blood pressure	Normal	27	45.0
	High	33	55.0
History of heart disease	Yes	8	13.3
	No	52	86.7
BMI	Normal	8	13.3
	High	52	86.7
Fasting blood sugar	Normal	17	28.3
	High	43	71.7
HbA1C	Normal	16	26.7
	High	44	73.3
Blood cholesterol	Normal	31	51.7
	High	29	48.3
Advice received on self-care	Yes	13	21.7
	No	47	78.3
Medication	Oral hypoglycemic	26	43.4
	Insulin	23	38.3
	Oral and insulin	11	18.3

Table 2 showed that (46.7%) of the studied group had duration of diabetes mellitus from (5 – 10 years). The onset of age of diabetes for (50%) of the studied group was (40 – 50 years). (68.3%) of the studied group had family history of diabetes mellitus and (55%) had elevated blood pressure and history of hypertension. (86.7%) of the studied group had high body mass index (BMI). (71.7%) of the studied group had high fasting blood sugar and (73.3%) had high HbA1C. (48.3%) of studied group had high blood cholesterol level and (78.3%) did not receive advice on self-care. (43.4%) of the studied group took oral hypoglycemic medications.

Table 3 illustrated that there was a highly statistically significant improvement on patient's knowledge about diabetic peripheral neuropathy at all knowledge items post one week and post three month of intervention. Before intervention, (55.0%); (61.7%) (78.3%) and (63.3%) of the patients gave incorrect answers about definition, causes, prevention and management of diabetic peripheral neuropathy respectively. After intervention, it was noted that the highest level of patient's knowledge was related to definition, causes, sign and symptoms of diabetic peripheral neuropathy with (100%) for each item respectively.

Table 3. Number and percentage distribution of Knowledge about diabetic peripheral neuropathy among studied group pre and post-intervention N=60

Knowledge Items	Pre intervention				1 week post intervention				3 months post intervention				McNemar test	P value
	Correct		Incorrect		Correct		Incorrect		Correct		Incorrect			
	No	%	No	%	No	%	No	%	No	%	No	%		
Definition	27	45.0	33	55.0	56	93.3	4	6.70	60	100	0	0.00	32.8 45.5	**P1:<0.001** **P2:<0.001****
Causes	23	38.3	37	61.7	60	100	0	0.00	60	100	0	0.00	53.5 53.5	**P1:<0.001** **P2:<0.001****
Sign and symptoms	28	46.7	32	53.3	60	100	0	0.00	60	100	0	0.00	43.6 43.6	**P1:<0.001** **P2:<0.001****
Complications	29	48.3	31	51.7	58	96.7	2	3.30	55	91.7	5	8.30	35.1 26.8	**P1:<0.001** **P2:<0.001****
Prevention	13	21.7	47	78.3	58	96.7	2	3.30	55	91.7	5	8.30	69.8 59.8	**P1:<0.001** **P2:<0.001****
Management	22	36.7	38	63.3	57	95.0	3	5.00	57	95.0	3	5.00	45.4 45.4	**P1:<0.001** **P2:<0.001****

**high significant
P1: comparison between pre intervention and 1 week post intervention
P2: comparison between pre intervention and 3 months post intervention.

Table 4. Number and percentage distribution of knowledge level about foot care among studied group pre and post-intervention (N =60)

Foot care items	Pre intervention		1 week post intervention		3 months post intervention		McNemar test.	P value
	Satisfactory	Un satisfactory	Satisfactory	Un satisfactory	Satisfactory	Un satisfactory		
	No (%)	(No) %	No(%)	(No)%	No(%)	(No)%		
Check foot daily	29(48.3)	31(51.7)	60(100)	0(0.00)	60(100)	0(0.00)	41.8 41.8	**P1:<0.001** **P2:<0.001****
Wash foot daily with warm water	32(53.3)	28(46.7)	59(98.3)	1(1.70)	60(100)	0(0.00)	33.1 36.5	**P1:<0.001** **P2:<0.001****
Dry between toes	24(40.0)	36(60.0)	60(100)	0(0.00)	59(98.3)	1(1.70)	51.4 47.8	**P1:<0.001** **P2:<0.001****
Apply lotion on foot	29(48.3)	31(51.7)	58(96.7)	2(3.30)	60(100)	0(0.00)	35.1 41.8	**P1:<0.001** **P2:<0.001****
Wearing socks	26(43.3)	34(56.7)	59(98.3)	1(1.70)	60(100)	0(0.00)	43.9 47.4	**P1:<0.001** **P2:<0.001****
Avoid heating pads on feet	24(40.0)	36(60.0)	59(98.3)	1(1.70)	60(100)	0(0.00)	47.8 51.4	**P1:<0.001** **P2:<0.001****
Not walking barefoot	26(43.3)	34(56.7)	59(98.3)	1(1.70)	55(91.7)	5(8.30)	43.9 31.9	**P1:<0.001** **P2:<0.001****
Use proper fitting shoes	24(40.0)	36(60.0)	57(95.0)	3(5.00)	48(80.0)	12(20.0)	41.3 20.0	**P1:<0.001** **P2:<0.001****
Checking shoes before wearing	25(41.7)	35(58.3)	46(76.7)	14(23.3)	50(83.3)	10(16.7)	15.2 22.2	**P1:<0.001** **P2:<0.001****
Not removing corn by self	17(28.3)	43(71.7)	44(73.3)	16(26.7)	40(66.7)	20(33.3)	24.3 17.6	**P1:<0.001** **P2:<0.001****
Cut foot nails straight	13(21.7)	47(78.3)	40(66.7)	20(33.3)	34(56.7)	26(43.3)	24.6 15.4	**P1:<0.001** **P2:<0.001****
Report any abnormal foot changes to doctor	23(38.3)	37(61.7)	39(65.0)	21(35.0)	40(66.7)	20(33.3)	6.03 7.00	**P1:0.014*** **P2:0.008****

**high significant
P1: comparison between pre intervention and 1 week post intervention
P2: comparison between pre intervention and 3 months post intervention.

Table 4 illustrated that there was a highly statistically significant improvement on patient's knowledge regarding all items about foot care post one week and post three month of intervention (P<0.001). Before intervention, the lowest level of satisfactory patient's knowledge was related to items that the patient didn't remove corn by self, cut foot nails straight and report any abnormal foot changes to doctor with (28.3%); (21.7%); (38.3%) respectively. After intervention, it was noted that the highest level of satisfactory patient's knowledge was related to knowledge items that the patient check and wash foot daily with warm water; Apply lotion on foot; Wearing socks and avoid heating pads on feet with (100%) for each item respectively.

Figure 1 showed that there was a highly statistically significant improvement of the studied group total knowledge about diabetic peripheral neuropathy pre and post-intervention with (83.3%; 91.7%) satisfactory knowledge after one week and after three months of intervention respectively.

Figure 2 illustrated that there was a highly statistically significant improvement of the studied group total knowledge about foot care pre and post-intervention with (95%, 93.3%) satisfactory knowledge after one week and after three months of intervention respectively.

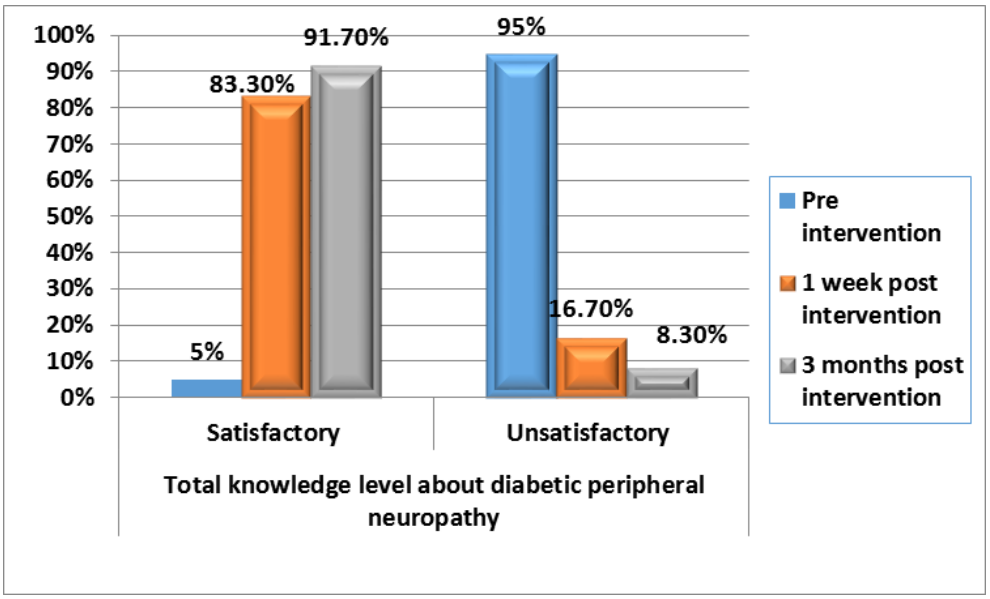

Figure 1. Number and percentage distribution of total knowledge level about diabetic peripheral neuropathy among studied group pre and post-intervention (N=60)

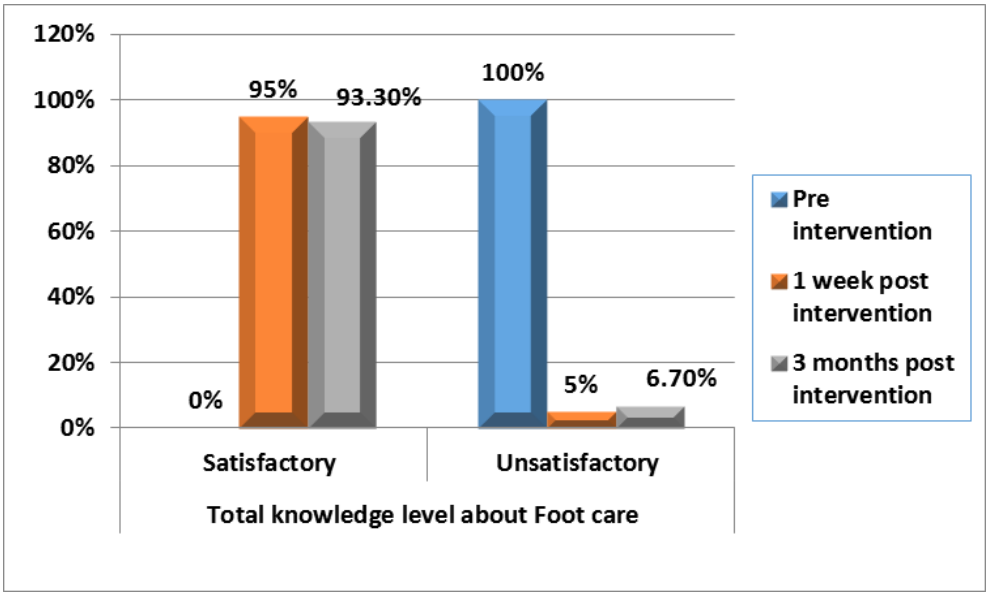

Figure 2. Number and percentage distribution of total knowledge level about foot care among studied group pre and post-intervention (N=60)

4. Discussion

Diabetic peripheral neuropathy usually develops after long duration of improper glycemic control but now it develops during the first 12 months of diabetes [16]. Targeting patients at increased risk for developing foot ulcer is cost effective to prevent foot complications. Therefore, the aim of the current study was to assess the effect of nursing instructions on diabetic patients' Knowledge about peripheral neuropathy and foot care.

Regarding to sociodemographic characteristics and medical data of studied sample

The results of the current study showed that the mean age of the studied group was (51.5±8.10). Most of studied group was female, married and more than half of them were illiterate. These results were consistent with [17] who reported in his study that the mean age group was (52.7 ± 11.9), male: female ratio was 1.02:1 and about one third of the sample was illiterate.

The current study findings revealed that only about one third of studied group was received advice on self- care about diabetic peripheral neuropathy and foot care before the intervention. This might be due to the lack of time for providing information by the health care professionals. This result is consistent with the study conducted by [12].

The current study findings concluded that longer duration of diabetes between 5-10 years in about two thirds of the studied sample, history of hypertension, high BMI, poor glycemic control with high fasting blood sugar level and high level of HbA1C and high level of blood cholesterol in most of the studied sample were risk factors for diabetic peripheral neuropathy. This report supports earlier predictions of diabetic complications and emphasizes towards its prevention and control by increasing the awareness among people with diabetes in Saudi Arabia [18]. Also, this is a reminder for preventing and treating these conditions that increase the risk of vascular complications and diabetic foot. Self -monitoring

is an important item for patients suffering from chronic diseases. Educating people with diabetes is an active process through which people come to learn about diabetes for their own survival and life quality. It is the prime mission of the International Diabetes Federation to promote diabetes care, prevention and cure worldwide [19].

Regarding to patient's knowledge about diabetic peripheral neuropathy, the current study showed that there was a highly statistically significant improvement on patient's knowledge about diabetic peripheral neuropathy at all knowledge items post one week and post three months of intervention. Before intervention, most of the studied sample gave incorrect answer about definition, causes, prevention and management of diabetic peripheral neuropathy respectively. After intervention, the majority of the studied sample had the highest level of knowledge about definition, causes, sign and symptoms of diabetic peripheral neuropathy with (100%) for each item respectively at $p < 0.001$. The above findings are consistent with a cross sectional study conducted to determine the level of awareness on diabetic peripheral neuropathy by [20]. This might be due to the effect of nursing instructions about peripheral neuropathy.

Regarding to patient's knowledge about diabetic foot care among the studied group, the current study illustrated that there was a highly statistically significant improvement on patient's knowledge regarding all items about foot care post one week and post three month of intervention. M_c Nemar's test results which compared post -test 1 after one week and post -test 2 after 3 months respectively with pre intervention showed the significant increase at $p< 0.001$ especially on foot care items such as checking foot daily, washing foot with warm water daily, and avoid using of heating pads on feet. So it showed the importance of foot care knowledge in caring foot among diabetic patients as a widely accepted fact, however in this study knowledge on not walking with barefoot, use of proper fitting shoes, knowledge on not to remove corn by themselves and follow the proper technique of cutting the nails did not show much difference in comparison between pre intervention and 1 week post intervention and 3 months post intervention. The findings was supported by other studies which revealed that the knowledge on foot care among patients with diabetes is on the rise but the patients are not adequately aware of all the foot complications and need to have continuous reinforcement [21,22].

Total knowledge about foot care among studied group revealed that no one of the studied sample had satisfactory level of knowledge about foot care pre intervention but the majority of them had satisfactory level of knowledge about foot care one week after intervention and three months after intervention. These findings are in the same line with [23] who reported that knowledge about foot care is low among patients with diabetes and their knowledge can be improved by proper health education by nurse specialist.

5. Conclusion

Implementation of nursing instructions regarding peripheral neuropathy and foot care was effective in improving diabetic patients' knowledge about them.

6. Recommendations

- Applying nursing instructions regarding peripheral neuropathy and foot care in other settings with a large sample to enhance and confirm the current results.
- Mass education program can be conducted to enhance awareness among the diabetic clients regarding peripheral neuropathy and its management.

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