

# Effectiveness of foot care nursing interventions on knowledge among patients with diabetes mellitus

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**Abstract** - A quasi experimental study was conducted to assess the effectiveness of foot care nursing interventions on level of knowledge regarding diabetic foot ulcer among 200 samples. Background variables and structured knowledge questionnaire were used to assess the level of knowledge. Foot care nursing interventions were given to the study groups 1(with Diabetic foot ulcer – DFU) and 2 (without DFU); whereas the control group 1 (with DFU) and control group 2 (without DFU) received regular care. The study revealed that majority of them (66.00%, 45.84%, 65.31%, and 50.00%) were at moderate risk for diabetic foot ulcer. Almost half the samples in both the study and control group without DFU and around 33.33% in the groups with DFU had low risk for diabetic foot ulcer. None of them had high risk. In the pre-test, majority of the samples (79.17%, 77.08%, 81.63% & 79.17%) in all four groups had inadequate knowledge. In post-test 1 and 2, most of the (41.67% and 54.17%) and (47.92% & 56.25%) samples in the study groups attained a moderate level of knowledge; whereas, in the control groups, majority continued to have inadequate knowledge. In post-test 3, above half the samples in both the study groups gained adequate knowledge; however, it was inadequate for those in the control groups. The baseline scores were almost similar for both study groups. The one-way ANOVA test indicates the absence of a significant statistical difference at  $p=0.99$ , ensuring homogeneity. By post-test 3, the majority of participants in the study groups had attained adequate knowledge (with DFU:  $18.54 \pm 3.38$ , without DFU:  $18.28 \pm 3.28$ ), whereas the control groups continued to show negligible improvement (with DFU:  $10.46 \pm 2.71$ , without DFU:  $10.38 \pm 3.09$ ). The one-way ANOVA test demonstrated an extremely significant difference between the groups ( $F=105.29$ ,  $P=0.001$ ), confirming the effectiveness of the intervention.

**Index Terms**—Foot care nursing interventions, diabetic foot ulcer, knowledge.

## I. INTRODUCTION

Health, the most invaluable gift, is one of the most vital elements of happiness that a person needs in their life, and it is a precious asset that has to be

actively nurtured and protected. Health is a multifaceted concept influenced by the interaction of various factors, including genetics, environment, and lifestyle practices.

Non-Communicable Diseases (NCDs) represent significant health challenges globally and are a series of chronic diseases that are typically caused by unhealthy behaviors. NCDs kill 41 million people each year, equivalent to 71% of all deaths globally<sup>1</sup>. The impact of NCDs and the resultant mortality is progressively increasing in magnitude with cardiovascular diseases, cancer, diabetes, and chronic respiratory diseases, placing tremendous demand on the health care system. Diabetes mellitus is both a standalone NCD and a key contributor to the progression and complications of other NCDs, including cardiovascular diseases, chronic kidney disease, and certain cancers. Diabetes is a multifaceted disease, a disorder of carbohydrate metabolism, characterized by the impaired ability of the beta cells of Langerhans to produce insulin or the body's response to insulin (insulin resistance), resulting in unstable glucose levels in the blood.

According to the World Health Organization (WHO) report in 2022, approximately 830 million adults were living with diabetes compared to 200 million adults in 1990.<sup>1</sup> The prevalence has been rising more rapidly in low- and middle-income countries when compared to the fall in the treatment coverage in these countries. Lower extremity complications are common among diabetic patients, and they show a rising trend in many regions of the world with an estimated prevalence of 1.8%. The complications vary from peripheral neuropathy, charcot arthropathy, foot ulcers, and infections to lower extremity amputations, which may lead to hospitalization and disability among the diabetics.

Diabetic Foot Ulcer (DFU) is one of the devastating diabetic complications associated with major

morbidity, mortality, and reduced quality of life and is the most common lower extremity complication of diabetes mellitus.

Diabetic foot is defined by WHO as the foot in diabetics with neurologic disorders, some degree of vascular involvement with or without metabolic complications of diabetes in lower extremity and prone to infection, scarring, with or without deep tissue damage. The CDC, 2019 stated that the lifetime risk of developing a foot ulcer for someone with diabetes is 15 - 25%; Every year, about 1-4% of people with diabetes develop a new foot ulcer; between 10-15% of diabetic foot ulcers do not heal; of diabetic foot ulcers that do not heal, 25% will require amputation. Approximately 20% of hospital admissions in people with diabetes are due to foot ulcers. In African countries, the prevalence of diabetic foot ulcers typically ranges between 10% and 30%, while lower-limb amputation (LLA) varies from 3% to 35%, based on data collected from hospital medical records.

In India, diabetic foot disease represents a real challenge to the national health systems and healthcare providers. The lifetime risk of a person with diabetes having a foot ulcer has been reported to be as high as 25%, with foot ulcers being the most frequent reason for hospitalization of patients with diabetes (about 30%). Many individuals with diabetes underestimate the importance of foot care or believe that foot complications are inevitable. Such misconceptions often lead to neglect, resulting in preventable complications.

Being specialized in medical and surgical nursing, the researcher has had extensive experience in managing diabetic patients suffering from second and third-degree diabetic foot ulcers. Observing and participating in the care of these patients has reinforced the critical need for comprehensive education at an early stage. Many diabetic patients lack basic knowledge about foot care, proper wound management, and the importance of glycemic control in preventing ulcer formation.

Additionally, the researcher's experience has highlighted the importance of well-integrated, continued care in a home setting. Since chronic wounds require long-term management, ensuring that patients and caregivers are well-informed about wound dressing techniques, infection control, and lifestyle modifications is crucial.

## II. PROBLEM STATEMENT

A quasi experimental study to assess the effectiveness of foot care nursing interventions on knowledge among patients with diabetes at selected setting, Chennai.

### AIMS OF THE STUDY

- To improve foot health outcomes
- To enhance patient knowledge and self-care
- To contribute to policies and evidence-based guidelines in the prevention and care of foot ulcers

### OBJECTIVES

- To assess the distribution of foot ulcers and its severity among patients with diabetes mellitus.
- To assess and compare the level of knowledge among the patients with diabetes mellitus in the study and control groups.
- To determine the effectiveness of foot care nursing interventions on the level of knowledge among the patients with diabetes mellitus in the study and control groups.

## II. METHODOLOGY

### A. Research approach

A quantitative research approach was used for the present study, as it aimed to assess the knowledge regarding foot care nursing interventions

### B. Research design

A quasi-experimental study design was considered appropriate for the present study to assess the knowledge of foot care nursing interventions among patients at risk for diabetic foot ulcer and among those who have developed foot ulcer

### C. Variables

The 21 variables were listed under demographic, family health, life-style and co-morbid health variables.

### D. Setting

The study was conducted at the diabetic OPD of a private multi-specialty hospital, Ambattur.

### E. Target population

All patients with diabetes aged 30 to 70 years who have either developed foot ulcer or those who had risk for development of foot ulcer

### F. Sampling

Non probability purposive sampling technique was used for this study. 50 in each group (study group with DFU, Study group without DFU, control group with DFU, control group without DFU), to a total of 200 was the sample size.

G. Inclusion criteria

Patients with diabetes aged between 30-70 years attending the OPD of SISH; who could understand English or Tamil; who had mild, moderate, or severe risk for diabetic foot ulcer, and who were mentally stable and could comprehend the package.

H. Exclusion criteria

Patients with diabetes who had 3rd-degree foot ulcer and already enrolled or attended any such intervention package.

I. Data collection & intervention tool

Sect A: Background variables

Sect B: Structured knowledge questionnaire containing 25 questions. For each correct answer, a score of '1' and for each incorrect answer, a score of '0' was given. The level of knowledge was be interpreted as:  $\leq 50$  – Inadequate; 51 – 74 – Mod. Adequate and  $\geq 75$  – Adequate.

Sect C: Intervention tool – Foot care nursing interventions including behavior change and communication and family counseling on foot care practices.

J. Content validity

The validity was obtained from experts including physicians, diabetologists, podiatrist, psychologist, physiotherapist, nursing and research experts.

K. Reliability

The reliability was assessed using test-retest method and the correlation coefficient value was high. Hence, the tool was reliable enough to assess the effectiveness of foot care nursing interventions on Knowledge regarding diabetic foot ulcer.

#### IV. DATA ANALYSIS

Section 1: To assess the distribution of foot ulcers & its severity among patients with diabetes

Table 4.1: Frequency and percentage distribution of overall risk for and severity of diabetic foot ulcer in the study and control groups.

Level of risk	Study groups				Control groups			
	With DFU (n=48)		Without DFU (n=48)		With DFU (n=49)		Without DFU (n=48)	
	n	%	n	%	n	%	n	%
No risk	0	00.00	0	00.00	0	0.00	0	00.00
Low risk	16	33.34	26	54.16	17	34.69	24	50.00
Moderate risk	32	66.66	22	45.84	32	65.31	24	50.00
High risk	0	00.00	0	00.00	0	00.00	0	00.00

Section II: To assess and compare the level of knowledge, attitude, foot care practice, risk status and clinical parameters among the patients with diabetes mellitus in the study and control groups

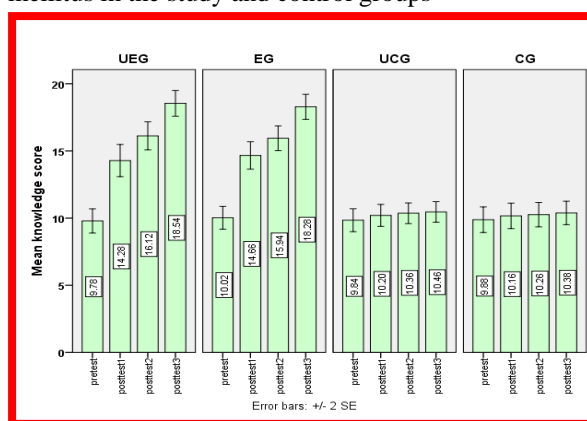


Fig 4.2.1 Comparison of overall knowledge score within study and control groups during pretest, post-test 1, post-test 2 and post-test 3

Figure 4.2.1 implies that in the pre-test, the mean knowledge score was 9.78 and 10.02, which had increased to 14.28, 16.12 & 18.54 and 14.66, 15.94 & 18.28 during the post-test 1, 2 and 3 for the study groups with DFU and without DFU. The control group's mean knowledge score did not vary much (9.84 to 10.46) during the post-tests 1, 2 and 3.

Table 4.2.1: Assessment of pretest and post-test level of knowledge gain scores among patients with diabetes mellitus in the study and control groups

Groups	Assessment	Mean Knowledge score	% of mean knowledge score	% of knowledge gain score
Study group with DFU	Pre test	09.78	39.12	35.04
	Post-test 1	14.28	57.12	
	Post-test 2	16.12	64.48	

	Post-test 3	18.54	74.16	
Study group without DFU	Pre test	10.02	40.08	33.04
	Post-test 1	14.66	58.64	
	Post-test 2	15.94	63.76	
	Post-test 3	18.28	73.12	
Control group with DFU	Pre test	09.84	39.36	2.48
	Post-test 1	10.20	40.80	
	Post-test 2	10.36	41.44	
	Post-test 3	10.46	41.84	
Control group without DFU	Pre test	09.88	39.52	2.00
	Post-test 1	10.16	40.64	
	Post-test 2	10.26	41.04	
	Post-test 3	10.38	41.52	

Table 4.2.1(c) specifies that in the study group with and without DFU, the pretest mean knowledge score was 09.78 & 10.02 and the knowledge gain score was 35.04% & 33.04% respectively. Over time, there was a steady improvement, with the mean score reaching 18.54 & 18.28 respectively by post-test 3. In contrast, the control group showed minimal improvement in knowledge scores across the assessments. In the control group with & without DFU, the pretest mean score was 9.84 & 9.88 with a knowledge gain score of only 02.48% & 02.00% respectively. By post-test 3, the mean score barely increased to 10.46 & 10.38 suggesting only minimal improvement.

Section III: To assess the effectiveness of foot care nursing interventions on level of knowledge, attitude, foot care practices, risk reduction and clinical parameters among the patients with diabetes mellitus in the study and control group.

Table 4.3.1 (a): Comparison of pre and post-tests mean knowledge score among patients with diabetes mellitus within the study and control groups

Pretest		Post-test 1		Post-test 2		One-way ANOVA
M	SD	M	SD	M	SD	
9.78	3.18	14.28	4.24	18.54	3.38	F=106.01 p=0.001 *** (S)
10.02	3.03	14.66	3.60	18.28	3.28	F=97.34 p=0.001 *** (S)
9.84	3.01	10.20	2.88	10.46	2.71	F=3.02 p=0.33 (NS)
9.88	3.38	10.16	3.36	10.38	3.09	F=2.33 p=0.13 (NS)

Table 4.3.1 (a) shows that the study group with DFU experienced a substantial increase in overall mean scores, rising from 9.78 (pretest) to 18.54 (post-test 3), reflecting a mean difference of 8.76. Similarly, the scores of those in the study groups without DFU increased from 10.02 (pretest) to 18.28 (post-test 3), yielding a mean difference of 8.26. The ANOVA results revealed a statistically significant difference between pretest and post-test scores for the study groups, with a p-value of <0.001. In contrast, the mean knowledge scores of both control groups showed only minimal changes, with no statistical difference observed between the tests.

Table 4.3.1 (b): Comparison of pre and post-tests mean knowledge score among patients with diabetes mellitus between the study and control groups

Study groups				Control groups				One-way ANOVA F test
With DFU	With out DFU	With DFU	With out DFU	With DFU	With out DFU	With DFU	With out DFU	
M	SD	M	SD	M	SD	M	SD	
Pre test								
9.78	3.18	10.02	3.03	9.84	3.01	9.88	3.38	F=0.05 P=0.99 (NS)
Post-test 1								
14.28	4.24	14.66	3.60	10.20	2.88	10.16	3.36	F=23.57 P=0.001 *** (S)
Post-test 2								
16.12	3.71	15.94	3.25	10.36	2.72	10.26	3.21	F=50.18 P=0.001* ** (S)
Post-test 3								
18.54	3.38	18.28	3.28	10.46	2.71	10.38	3.09	F=105.29 P=0.001* ** (S)

The above table denotes that the baseline scores were almost similar for both study groups. The one-way ANOVA test indicates the absence of a significant statistical difference at p=0.99, ensuring homogeneity. In post-test 1, the study groups showed a marked improvement in knowledge levels (with DFU: 14.28 ± 4.24, without DFU: 14.66 ± 3.60), whereas the control groups displayed minimal change (with DFU: 10.20 ± 2.88, without DFU: 10.16 ± 3.36). By post-test 3, the majority of participants in

the study groups had attained adequate knowledge (with DFU:  $18.54 \pm 3.38$ , without DFU:  $18.28 \pm 3.28$ ), whereas the control groups continued to show negligible improvement (with DFU:  $10.46 \pm 2.71$ , without DFU:  $10.38 \pm 3.09$ ).

## V. DISCUSSION

The investigator assessed the risk and severity of foot ulcers. It was identified that 66.66% & 45.84% in both the study groups and 65.31% & 50.00% in both the control groups had moderate risk for diabetic foot ulcer. None of them had no risk or high risk. Around two-fifths in all groups were at low risk for developing DFU.

Tania MV et al. performed a meta-analysis of proportions using a random-effects model. The meta-analysis encompassing 36 studies from 23 countries, with a total of 11,850 participants, estimated the overall prevalence of diabetic foot at risk (including those with existing ulcers and those at risk of developing ulcers) to be 53.2%. This analysis also noted substantial heterogeneity across studies.

With regard to knowledge, the study group with DFU experienced a substantial increase in overall mean scores, rising from 9.78 (pretest) to 18.54 (post-test 3), reflecting a mean difference of 8.76. Similarly, the scores of those in the study groups without DFU increased from 10.02 (pretest) to 18.28 (post-test 3), yielding a mean difference of 8.26, revealing a statistically significant difference between pretest and post-test scores for the study groups, with a p-value of  $<0.001$ .

The above findings were consistent with the Randomized Control Trail study conducted by Prabhasini. M, et al, to assess the change in foot-care knowledge and practice scores, before and after interventions, among patients with DM. Significant improvement in knowledge scores in both Groups 2 and 3 was seen after the intervention and this improvement in knowledge was significantly higher in Group 2 compared with Group 1 ( $p = 0.017$ ) and Group 3 compared with Group 1 ( $p < 0.001$ ).

## VI. RECOMMENDATIONS

- The study can be complicated on a large sample to validate & generalize the findings.
- Similar studies can be conducted on different populations & different settings.

- A comparative study can be conducted in urban areas to know the difference in the level of knowledge among women in urban settings

## VII. CONCLUSION

To maximize the impact of foot care nursing interventions, healthcare institutions must prioritize preventive foot care programs, allocate adequate resources, and implement standardized screening protocols by collaborating with healthcare providers and policymakers.

Investing in foot care education and nursing interventions is not only a medical necessity but also a strategic approach to reducing the global burden of diabetic foot complications.

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