
▪ **Basic Research**

BASNEF Model Based Educational Guidelines regarding Foot Care among Type II Diabetic Patients

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Abstract

Background: Patients with diabetes need to take special care of their feet because poor foot health can lead to major foot complications including ulcers and amputation, which can be avoided through adequate guidance. **Aim:** This study aimed to appraise the effect of BASNEF model based educational guidelines regarding foot care among type II diabetic patients. **Research design:** A quasi-experimental research design was utilized. **Setting:** The study was carried out at two Outpatient Clinics (Internal Medicine and Surgery) at Benha University Hospital. **Sample:** Purposive sample of 110 patients separated into study and control groups, each group included 55 patients. **Tools:** Three tools were used; **Tool I:** An interviewing questionnaire comprised three parts as patients' demographic characteristics, patients' medical history and patients' knowledge. **Tool II:** Reported foot care practices. **Tool III:** BASNEF model to assess patients' belief, attitude, subjective norms and enabling factors regarding foot care. **Results:** The present study revealed that there was a significant enhancement in mean scores of study group total knowledge, reported foot care practices and BASNEF model scores, post and after three months of educational guidelines implementation compared with control group. Additionally; there was a statistically significant correlation between the total BASNEF scores and total knowledge and total reported practices of study group post and follow up the educational guidelines. **Conclusion:** Implementing BASNEF model based educational guidelines enhanced the study group patients' knowledge, reported foot care practices, beliefs, attitudes, subjective norms and enabling factors regarding foot care. **Recommendations:** Distribution of an educational booklet to the Internal Medicine and Surgery Outpatient clinics at Benha City Hospitals to be available to all diabetic patients.

Key words: BASNEF Model, Educational Guidelines, Foot Care, Type II Diabetes, Patients

Introduction

Diabetes is a long-term metabolic disorder marked by high blood glucose (known as blood sugar), which over time can seriously hurt the blood vessels, heart, eyes, kidneys, and nerves. The most prevalent type of diabetes is type II, which often afflicts adults, and occurs when the body stops manufacturing adequate insulin or becomes insulin resistant. Across the last three decades, type II diabetes prevalence has intensely increased at all income levels of countries (**Dwivedi & Pandey, 2020**).

Today, diabetes requires immediate care due to the large number of affected patients and its associated consequences, which can influence numerous body systems in the form of nephropathy, retinopathy, neuropathy, diabetic foot, and cardiovascular conditions. These issues place a heavy financial and human burden on society. The prevalence of type II diabetes is expected to rise from 171 million in 2000 to 366 million in 2030 (**Ali Khani et al., 2018**).

Diabetic foot is the most frequent cause for non-traumatic amputations and a long-term complication of diabetes mellitus. Diabetic foot ulcers occur in about 15% of diabetic people (**Hernandez-Cardoso et al., 2022**). According to data, the likelihood of developing a Diabetic Foot Ulcer (DFU) throughout the course of lifetime of diabetic patient is up to one in three. A key factor that leads to hospitalization, amputation, disability, and death in diabetic patients are non-healing DFUs (**Boulton, 2021**).

One of the best strategies to prevent foot issues in diabetic patients is daily care. Most diabetic patients have some degree of nerve damage. Particularly, the feet and legs are most frequently affected. Loss of sensation in the feet may result from nerve damage. Regular check-ups, a healthy diet, a modification in lifestyle, taking medications as prescribed, controlling blood sugar, performing good foot care habits, examining feet daily, and preventing activities that could hurt the feet are all important foot care practices for diabetic patients. Early detection and prevention of complications are made possible by these measures (**Abbot et al., 2022**).

The beliefs, attitudes, subjective norms, and enabling factors (BASNEF) model is a helpful educational model; its four key components are successful in increasing patients' adherence to healthy behaviors. The BASNEF model was first presented by John Hubley in 1988 and is used for the identification and evaluation of various behavioral patterns. It also aids in the creation of new attitudes and behaviors with regard to a particular problem (**Akbarzadeh et al., 2017**). The BASNEF model is a simplified method for understanding behavior that can encourage early adoption of healthier routines and a more active lifestyle

to foster long-term well-being and financial security. It is also successful in enhancing patients' knowledge, attitudes, and behaviors (**Pirzadeh et al., 2018**).

Community health nurses are essential in the delivery of healthcare, education, consultation, being transformational leaders, conducting research, and advocating for the rights of diabetic patients. However, this action plan highlighted the roles of nurses in the prevention and treatment of diabetic foot complications and outlined some of the difficulties experienced by patients (**Davis, 2017**). The nurse can identify the patient's risk level and the condition of their feet. The nurse provides recommendations such as quitting smoking, daily foot inspections, seeking assistance with any issues, and wearing suitable footwear can lower the risk of ulcers and enhance quality of life. The nurse also teaches the patient to manage their health to prevent foot problems (**Nazarko, 2019**).

Significance of the study:

The number of adult diabetic patients in Egypt was 8,850,400 in early 2020, with a prevalence of 15.2%, placing Egypt ninth in the world for Diabetes Mellitus (DM) prevalence. Egypt is anticipated to rank as the seventh country globally (**Abouzeid et al., 2022**). One of the main complications of diabetes is diabetic foot. Diabetic Foot Ulceration (DFU) has a 10-15% likelihood of occurring. 60–80% of foot ulcers will heal, but 10-15% will still be active and 5-24% will result in amputation of the affected limb. DFU is prevalent in hospitalized patients at a rate of 4 to 10%, and the lifetime risk of getting foot ulcers might be as high as 25% (**Tawfik et al., 2022**).

Diabetic foot care is crucial since the disease can be hazardous to the feet; even a little cut can have negative effects. Diabetes may harm the nerves that control feeling and restrict blood flow to the feet, making it more difficult to heal wounds and fight infections. Due to these issues, it is important to pay attention and take care of the foot to avoid placing the patient at risk of having an amputation (**Atinafu et al., 2022**). Therefore, the current study was carried out to evaluate the effect of BASNEF model based educational guidelines regarding foot care among type II diabetic patients.

Aim of the study:

This study aimed to appraise the effect of BASNEF model based educational guidelines regarding foot care among type II diabetic patients, through:

- Assessing type II diabetic patients' knowledge regarding diabetes mellitus and foot care.
- Assessing type II diabetic patients' reported practices regarding foot care.
- Assessing type II diabetic patients' beliefs, attitudes, subjective norms, and enabling factors regarding foot care

- Developing and implementing BASNEF model based educational guidelines regarding foot care according to patient's needs
- Evaluating the effect of BASNEF model based educational guidelines regarding foot care among type II diabetic patients.

Research hypothesis

Type II diabetic patients who will receive the BASNEF model based educational guidelines will have improved knowledge, reported foot care practices, beliefs, attitudes, subjective norms, and enabling factors regarding foot care than those who will not receive the educational guidelines.

Operational definitions:

BASNEF model: acronym for the component parts; beliefs, attitudes, subjective norms and enabling factors. Focusing on modifying only those components that are essential to influencing modifiable behaviors.

Type II diabetes mellites: A condition known as insulin resistance in which the body's ability to respond to insulin is diminished. This condition causes insulin to become inefficient, which is initially countered by an increase in insulin synthesis to maintain glucose homeostasis. However, over time, insulin production declines, leading to type II diabetes mellites.

Subjects and method:

Research design:

A quasi-experimental research design was utilized in this study through two groups (control and study) with (pre/post-test and three months follow up).

Setting:

The study was accomplished at two Outpatient Clinics (Internal Medicine and Surgery) at Benha University Hospital, in Benha City, Egypt.

Sampling:

Sample type and criteria: A Purposive sample of 110 patients diagnosed with diabetic foot problems from total (333) type II DM patients during the previous year (2021) with the following inclusion criteria: Patients who had diabetes mellitus for no less than 5 years, aged ≥ 50 years and accept to participate in the study.

Sample Size: The sample size was determined by using Stephen Thampsons equation (Fearon et al., 2017):

$$n = \frac{N \times p(1-p)}{((N-1) \times (d^2 + z^2)) + p(1-p)} = 110$$

N = Population size is 333, **p** = Ratio provides a neutral property is equal to 0.12, **d** = the error rate is equal to 0.05, **z** = Class standard responding to the level of significance equal to 1.96.

The patients were randomly and equally separated into two groups (study group comprised 55 patients who received BASNEF based educational guidelines and control group involved 55 patients who didn't receive the educational guidelines).

Tools for data collection:

Three tools were utilized in this study as follows:

Tool I: An interviewing questionnaire: Was established by the researchers following the examination of pertinent local and international literature, and it was subsequently translated into clear Arabic, it was composed of three parts:

Part 1: Patients demographic characteristics included 7 closed ended questions as: Age, sex, marital status, educational level, residence, occupation, and monthly income.

Part 2: Patients medical history; included 5 questions as past history of any disease, family history of diabetes, smoking, presence of high blood glucose level, and duration of diabetes.

Part 3: A- Patients knowledge regarding type II diabetes mellitus and involved 8 closed ended questions such as: Meaning, risk factors, causes, sign and symptoms, diagnosis, treatment, complications and prevention.

B- Patients knowledge about diabetic foot and composed of 5 closed ended questions about (meaning, risk factors, causes, sign and symptoms, and prevention) used pre, post, follow up the educational guidelines.

Scoring system

Each item of knowledge was scored as follows: Complete correct answer took "two" grades, incomplete correct answer took "one" grade and don't know took "zero". The total knowledge score ranged from (0- 26). The total score was classified as the following: Good $\geq 75\%$ (≥ 20) grades, average $60 - < 75\%$ ($16 - < 20$) grades and poor $< 60\%$ (< 16) grades.

Tool II: Reported foot care practices adopted from (Bijoy et al., 2012 & Tawfik et al., 2022) and modified by the researchers to evaluate the studied patients practices regarding foot care such as daily foot care (10 items), footwear (5 items), foot inspection (5 items) and wound care (7 items) used pre, post and follow up after three months of educational guidelines.

Scoring system

Each item of studied patients' reported practices was scored as: Done= 1 and Not done= 0, the total practices comprise 27 items = 27 grades. The total score was converted into a percent score and classified as the following: Satisfactory level $\geq 60\%$ (≥ 16) score and unsatisfactory level $< 60\%$ (< 16 score).

Tool III: BASNEF Model Questionnaire: It was adopted from (Mehrabian et al., 2016) and modified by the researchers. This model was used (pre, post and three months follow up of the educational guidelines) and consisted of 4 sections:

Section (1): Patients health believes regarding foot care: It included 14 items as;(daily foot care is important to prevent foot problems, glucose level should be checked once a month, checking blood glucose is responsibility of doctor only, foot care is not important as glycemic control,etc.). The patient's response was graded on a two-point Likert scale (yes/no), with a score of (1) for a yes response and a score of (0) for a no response for each item. The range of the total scores was 0 to 14 and classified as follows: Strong health beliefs were identified by a score of 10 to 14 ($\geq 75\%$), neutral health beliefs were represented by a score of 7 < 10 ($50 < 75\%$), and weak health beliefs were identified by a score below 7($< 50\%$).

Section (2): Patients attitude regarding foot care: It included 13 items as (I think diabetic patient should receive special care for feet, I think diabetic patient should take responsibility for self- foot examination, should diabetic patient have their feet examined regularly by a specialist, I think I need to update my knowledge of how to perform foot care..... etc.). The patient's response was evaluated using a three-point Likert scale, where "agree" received a score of 2, "uncertain" received a score of 1, and "disagree" received a score of 0. The total attitude scores varied from 0 to 26. And classified into positive attitude calculated from $\geq 60\%$ which ranged from (16-26 score) and negative attitude from $< 60\%$ (< 16 score).

Section (3): Patients subjective norms regarding foot care. It included 13 items as (Do you examine your feet regularly? do you wash and dry your feet and between toes every day? do you use moistening foot products? do you walk bare foot? ...etc.) The patient's response was scored as follows: Yes, received a score of (1), while no received (0). The total scores varied from 0 to 13, and higher scores (8-13 scores) stated that the subjective norms were having a greater effect on patients' foot care.

Section (4): Patients enabling factors regarding foot care: It included 8 items as; family assistance for proper foot care, accessibility of referral service, have access to available

health insurance, ...etc. The patient's response was evaluated as follows; “yes” obtained a score of 1, and “no” scored 0. The range of the total scores was 0 to 8. The higher scores(5-8scores) showed a positive effect of enabling factors for foot care.

Administrative design

A formal letter to conduct the study was submitted from the Dean of Faculty of Nursing, Benha University to the director of Benha University Hospital, requesting agreement and cooperation to conduct the study after outlining its objectives.

Ethical considerations:

The researchers explained the study goals to each patient and took their informed consent. Patients were also assured that their anonymity, privacy, and safety would be preserved and that all information would be used only for the study's purposes. Additionally, patients are allowed to leave the study whenever they want.

Tools validity

A panel of three professionals in the field of Community Health Nursing evaluated the data collection tools to ensure that the content was accurate, clear, and appropriate. Accordingly, the necessary modifications were made in order to ensure relevance and completeness.

Tools reliability:

The Cronbach's Alpha coefficient test was applied to determine the reliability, and findings showed that each tool contained generally homogenous questions, as evidenced by the moderate to high reliability of the tools. Internal consistency for the knowledge was 0.894, reported foot care practices were 0.945 and the BASNEF Model sections; 0.835 for beliefs, 0.463 for attitude, 0.787 for subjective norms, and 0.746 for enabling factors and for total BASNEF was 0.850.

Pilot Study

A pilot study including 10% (11) of the patients was conducted to evaluate the tools and determine how long they would take to complete. It was done to confirm the clarity and usefulness of the study tools. Moreover, to identify any issues that might arise for the researchers when gathering data. Because no changes were made, the patients who participated in the pilot were incorporated in the total study sample.

Field work:

Following the official approval to conduct the study and getting the patients consents, the researchers were available in the study setting two days a week (Sunday and Wednesday) from 9 am to 1 pm. As the patients had follow-up appointments for their

diabetes at the Internal Medicine Outpatient Clinic and their diabetic foot at the Surgery Outpatient Clinic, the researchers met the patients there. The fieldwork was completed over a nine-month period, started from the beginning of October 2021 to the end of June 2022. Interviews with the study participants were conducted at the clinic's waiting area. An individualized interview was conducted with every patient. Each week, 4-5 patients were interviewed on average. The patients were given the questionnaire, and the researchers marked the responses. Depending on how well the patient understood the questions, the duration of each interview to finish the questionnaire was 15 to 20 minutes.

BASNEF model based educational guidelines was constructed through:

A. Preparatory phase:

To accomplish the research goal, the researchers first reviewed articles from both national and international sources that addressed different features of the research problem. This supported the establishment of the study tools and assisted the researchers in understanding the scope and significance of the problem.

B. Assessment phase:

In this phase, the researchers interviewed and welcomed the patients, outlined the objectives of the study, gave them all pertinent information on the study's duration and activities, and obtained their informed consent. The study participants were given a questionnaire to fill, which targeted to assess their knowledge, practices, beliefs, attitudes, subjective norms, and enabling factors. Analysis of the data from the pretest was then carried out to assist in the development of educational guidelines. The number of patients who were interviewed depended on their attendance.

C. Planning phase:

The educational guidelines based on BASNEF model regarding foot care was developed in simplified Arabic language depended on the outcome attained from the assessment phase. The educational sessions were planned. Contents, teaching methods, and the media to be utilized based on patients understanding have been determined. The telephone calls schedules were performed in accordance with needs that were identified, and objectives are developed.

General objectives

The general objectives of the educational guidelines were to enhance patients' knowledge, practices, believes, attitudes, subjective norms and enabling factors regarding foot care.

Specific objectives: which included

- Providing studied patients with needed knowledge regarding type II diabetes and diabetic foot.
- Improving studied patients' demonstration of proper foot care practices as reported.
- Modifying studied patients' health belief and attitudes regarding foot care.
- Promoting subjective norms and enabling factors regarding foot care for studied patients

D. Implementation phase

The studied patients were divided randomly into two groups (study and control group) each group were 55 patients. Then, the educational guidelines were applied through 6 scheduled sessions (3 theoretical and 3 practical sessions), every session lasted 30 to 45 minutes. The total number of patients who took the educational guidelines was 55 divided into 10 small groups, each involved 5- 6 patients. The educational guidelines were provided at the waiting area of the clinic. Teaching methods used were lecture, questions and answers, group discussion, demonstration, redemonstration and Power-Point presentation. The educational content of sessions involved modification of wrong believes, and wrong understanding about diabetes and foot care, also improve their knowledge and practices regarding foot care using BASNEF model. A brief overview to the educational guidelines and BASNEF model and its aim was done at the beginning of the first session. Every session started with a brief orientation of the prior one. The educational guidelines were implemented through the following sessions:

Three theoretical sessions:

Session (1): Included explanation about DM concerning meaning, types, risk factors, causes, manifestations, diagnosis, treatment, complications and prevention.

Session (2): The researchers provide description about nature of diabetic foot as meaning, risk factors, causes, manifestations, and prevention.

Session (3): BASNEF model meaning, sections and its importance in modifying patients' beliefs, attitude and subjective norms.

Three practical sessions:

Session (1): The researchers provide description about daily foot care practices

Session (2): Patients received explanation about foot wear and inspection of foot practices.

Session (3): The researcher demonstrated wound care practices.

E. Evaluation phase:

The effect of BASNEF model based educational guidelines was evaluated using posttest, subsequently a follow-up test was performed three months later through telephone conversations or outpatient clinic visits utilizing the same pretest tools for the study and control groups. Additionally, each patient also received a weekly phone call, to make sure that the educational guidelines were followed.

Statistical analysis:

Data were analyzed via the Statistical Package for Social Sciences (SPSS), version 22. The descriptive data, were coded, revised, tabulated and statistically analyzed included: numbers, percentages, mean, standard deviations and tests of significance as (independent t-test, chi-square test) was assessed. Degrees of significance of the results was considered non-significant (NS) if $p > 0.05$, significant (S) if $p \leq 0.05$ and highly significant (HS) if $p \leq 0.001$.

Results:

Table (1) displays that 60% of the study group and 61.8% of the control group aged between 55-<60 with mean 57.41 ± 4.17 and 58.22 ± 3.75 years respectively. 81.8% and 87.3% of both groups were females respectively, 38.2% of the study group and 20% of control group had secondary education and 76.4% and 85.5 of both groups were from rural areas respectively. Moreover, 67.3% and 74.5% of both groups didn't have enough monthly income

Table (2) shows that 74.5% of the study group and 81.8% of the control group had history of other chronic diseases and 80% and 70.9% of both groups had family history of diabetes respectively. Also, 78.2% and 83.6% of study and control group didn't have history of smoking respectively and 89.1% and 78.2% of them had high blood glucose levels respectively and 67.3% and 72.7% of both groups suffering from diabetes for more than 5 years.

Table (3) clarifies that there were highly statistically significant differences between study and control groups regarding total knowledge about type II DM and diabetic foot and total knowledge ($p < 0.001$) post educational guidelines and follow up after 3 months of educational guidelines implementation.

Figure (1) illustrates that 21.8% of the study group had good total knowledge level pre-educational guidelines and improved to 74.5% and 67.2% post educational guidelines and follow up after three months of educational guidelines implementation respectively. While 23.6% of control group had good total knowledge level pre-educational guidelines and

reached to 25.5% and 23.6% post educational guidelines and follow up after three months of educational guidelines implementation respectively.

Table (4) explains that there were a statistically significant differences ($p < 0.005$) between study and control groups in relation to (daily foot care, foot wear, and foot inspection) post and follow up after three months of educational guidelines implementation. Additionally; there was a statistically significant difference between study and control groups in relation to total reported foot care practices post educational guidelines ($p < 0.001$) and follow up after three months of educational guidelines implementation ($p < 0.005$).

Figure (2) portrays that 41.8% of the study group had satisfactory total reported foot care practices level pre-educational guidelines and improved to 83.6% and 85.5% post and follow up after three months of educational guidelines implementation respectively. While 40% of the control group had satisfactory total reported foot care practices level pre-educational guidelines and slightly improved to 43.6% and 41.8% post and follow up after three months of educational guidelines implementation respectively.

Table (5) demonstrates that there were highly statistically significant differences between study and control group regarding total attitude, total subjective norms and total enabling factors post educational guidelines implementation ($p < 0.001$). Also, there was a highly statistically significant difference between both groups regarding total BASNEF model items post and follow up of educational guidelines implementation ($p < 0.001$).

Table (6) presents that there was no statistically significant correlation between the studied groups total knowledge, total reported foot care practices and total BASNEF score pre-educational guidelines, while there was statistically significant positive correlation between total knowledge, total reported foot care practices and total BASNEF score of study group post and after follow up of educational guidelines implementation ($p < 0.005$).

Table (7) reveals that there was no statistically significant correlation between the studied groups total knowledge and total reported foot care practices pre-educational guidelines. While there were statistically significant positive correlations between total knowledge and total reported foot care practices of study group post ($p < 0.005$) and after follow up of educational guidelines implementation ($p < 0.001$).

Table (1): Frequency distribution of studied patients (study and control groups) regarding their demographic characteristics (n=110).

Demographic characteristics	Study (n=55).		Control (n=55).		X ²	p-value
	No.	%	No.	%		
Age/ yrs						
50-<55	13	23.6	11	20.0	.234	.889
55-<60	33	60.0	34	61.8		
≥60	9	16.4	10	18.2		
	Mean ±SD 57.41±4.17		Mean ±SD 58.22±3.75			
Gender						
Male	10	18.2	7	12.7	.626	.429
Female	45	81.8	48	87.3		
Marital status						
Single	7	12.7	5	9.1	2.947	.400
Married	32	58.2	39	70.9		
Widowed	9	16.4	4	7.3		
Divorced	7	12.7	7	12.7		
Education						
Not read and write	12	21.8	11	20.0	5.392	.145
Basic education	19	34.5	28	50.9		
Secondary education	21	38.2	11	20.0		
University education	3	5.5	5	9.1		
Residence						
Rural	42	76.4	47	85.5	1.471	.225
Urban	13	23.6	8	14.5		
Occupation						
Not working	21	38.2	26	47.3	1.458	.482
Working	18	32.7	18	32.7		
Retired	16	29.1	11	20.0		
Monthly income						
Not enough	37	67.3	41	74.5	4.895	.087
Enough	18	32.7	11	20.0		
Enough ad Saving	0	0.0	3	5.5		

Not significant (p > 0.05)

Table (2): Frequency distribution of studied patients (study and control groups) regarding their medical history (n=110).

Medical history	Study (n=55).		Control (n=55).		X ²	p-value
	No	%	No	%		
History of other chronic diseases						
No	14	25.5	10	18.2	0.853	0.356
Yes	41	74.5	45	81.8		
Family history of diabetes						
No	11	20.0	16	29.1	1.227	0.268
Yes	44	80.0	39	70.9		
History of smoking						
No	43	78.2	46	83.6	0.530	0.467
Yes	12	21.8	9	16.4		
Presence of high blood glucose level						
No	6	10.9	12	21.8	2.391	0.122
Yes	49	89.1	43	78.2		
Duration of diabetes (in years)						
5 years	18	32.7	15	27.3	0.390	0.533
>5 years	37	67.3	40	72.7		

Not significant (p > 0.05)

Table (3): Comparison between studied patients (study and control groups) regarding their mean score of knowledge pre, post and follow up after 3 months of the educational guidelines (n=110).

Knowledge items	Study group (n=55)						Control group (n=55)						T test (1)	P value	T test (2)	P value	T test (3)	P value
	Pre Guidelines		Post Guidelines		Follow up (after 3 months)		Pre Guidelines		Post Guidelines		Follow up (after 3 months)							
	Mean	± SD	Mean	± SD	Mean	± SD	Mean	± SD	Mean	± SD	Mean	± SD						
Total knowledge about type II DM	6.89	4.16	7.32	4.00	7.00	4.18	6.21	4.56	13.47	3.67	3.56	5.25	.808	.421	8.389	.000**	5.253	.000**
Total knowledge about diabetic foot	4.92	2.01	5.40	1.99	5.09	2.01	4.18	2.34	8.18	2.31	6.85	2.39	1.792	.076	6.757	.000**	4.185	.000**
Total	11.81	5.48	13.29	5.59	11.98	5.37	10.40	6.33	21.65	5.43	17.74	5.43	1.255	.212	7.952	.000**	5.590	.000**

** Highly statistically significant difference $p < 0.001$ Not significant $p > 0.05$

t1 independent t test between study and control pre educational guidelines

t2 T independent t test between study and control post educational guidelines

t3 independent t test between study and control after 3 months of educational guidelines

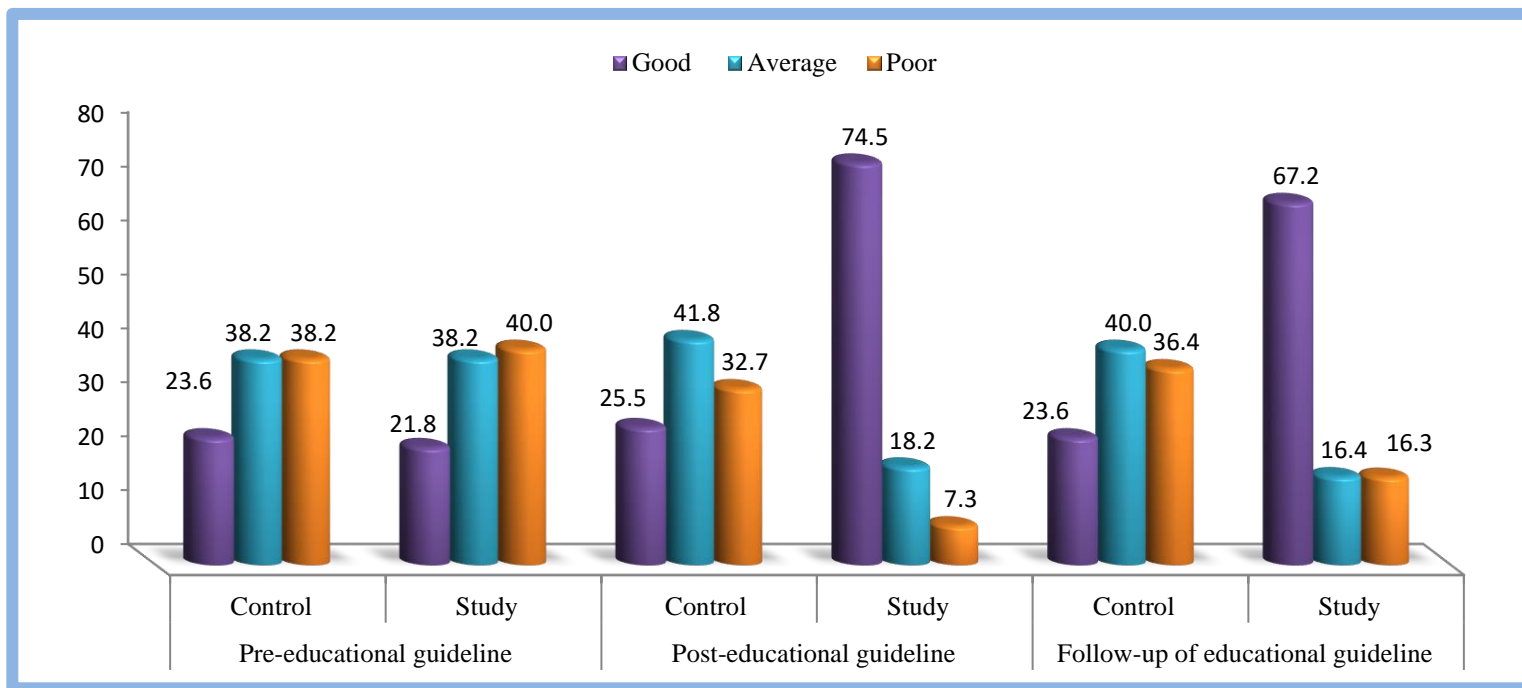


Figure (1): Percentage distribution of studied patients (control and study group) regarding their total knowledge level pre, post and follow-up after 3 months of the educational guidelines (n=110).

Table (4): Comparison between studied patients (study and control groups) regarding their mean score of reported foot care practices pre, post and follow-up after 3 months of the educational guidelines (n=110).

Foot care practices items	Study group (n=55)						Control group (n=55)						T test (1)	P value	T test (2)	P value	T test (3)	P value
	Pre Guidelines		Post Guidelines		Follow up (after 3 months)		Pre Guidelines		Post Guidelines		Follow up (after 3 months)							
	Mean	± SD	Mean	± SD	Mean	± SD	Mean	± SD	Mean	± SD	Mean	± SD						
Daily foot care	3.47	3.93	6.03	3.94	5.92	3.68	3.87	3.92	3.96	3.99	3.80	3.96	.534	.594	2.417	.015*	2.455	.012*
Foot wear	1.89	2.33	4.75	2.39	3.65	2.31	1.98	2.36	2.05	2.39	1.96	2.37	.203	.840	2.513	.013*	2.644	.011*
Foot inspection	1.67	1.65	2.74	1.62	3.25	1.64	1.78	1.73	1.92	1.83	1.78	1.73	.373	.737	2.477	.015*	2.464	.014*
Wound care	2.43	2.00	5.10	2.17	4.76	1.92	2.45	1.90	2.56	2.04	2.54	1.97	.049	.961	6.326	.000**	5.590	.000**
Total	8.75	7.71	15.63	8.00	14.07	6.20	9.41	7.98	10.09	8.36	9.83	8.18	.450	.654	3.552	.001**	3.060	.003*

** Highly Statistically significant $p < 0.001$

*Statistically significant $p < 0.05$

Not significant $p > 0.005$

t1 independent t test between study and control pre educational guidelines

t2 independent t test between study and control post educational guidelines

t3 independent t test between study and control after 3 months of educational guidelines

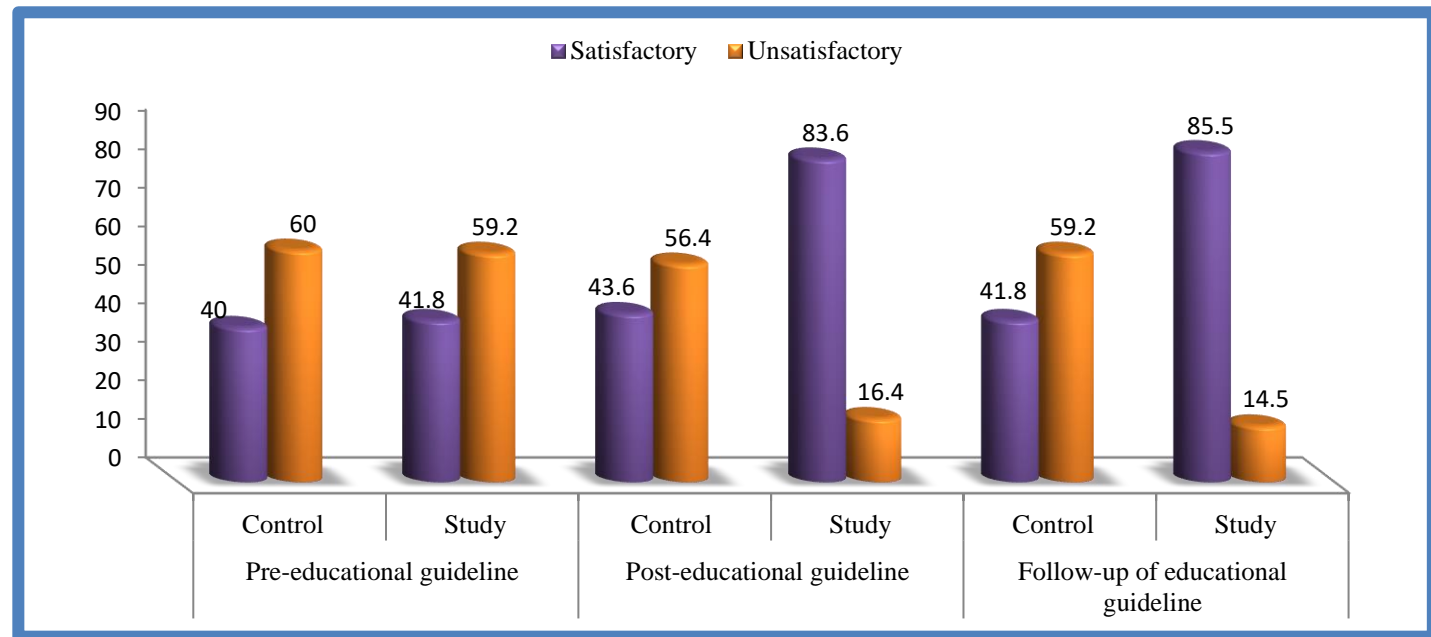


Figure (2): Percentage distribution of studied patients (control and study group) regarding their total reported foot care practices level pre, post and follow-up after 3 months of the educational guidelines (n=110).

Table (5): Comparison between studied patients (study and control groups) regarding their mean score of BASNEF model items pre, post and follow-up after 3 months of the educational guidelines (n=110).

BASNEF model items	Pre Guidelines		Post Guidelines		Follow up (after 3 months)		T test (1)	P value	T test (2)	P value	T test (3)	P value
	Mean	± SD	Mean	± SD	Mean	± SD						
Total belief												
Study	5.58	3.69	5.87	3.32	6.23	2.63	-.104	.918	.304	.761	.870	.386
Control	5.50	3.66	5.67	3.55	5.70	3.64						
Total attitude												
Study	13.47	3.71	20.20	6.80	18.20	5.83	.130	.897	6.105	.000**	4.639	.000**
Control	13.56	3.64	13.81	3.71	14.07	3.07						
Total subjective norms												
Study	4.45	3.22	9.70	3.25	5.21	3.35	.088	.930	7.841	.000**	.561	.576
Control	4.50	3.28	4.78	3.33	4.85	3.43						
Total enabling factors												
Study	3.32	2.27	5.83	2.78	4.40	2.42	.084	.934	4.413	.000**	1.972	.051
Control	3.36	2.28	3.61	2.48	3.49	2.41						
Total												
Study	26.83	9.66	41.61	11.74	34.05	8.65	.059	.953	6.544	.000**	3.432	.001**
Control	26.94	9.87	27.89	10.20	28.12	9.44						

** Highly Statistically significant $p < 0.001$ *Statistically significant $p < 0.05$ Not significant $p > 0.005$

t1 independent t test between study and control pre-educational guidelines

t2 T independent t test between study and control post educational guidelines

t3 independent t test between study and control after 3 months of educational guideline

Table (6): Correlation between total knowledge score, total reported foot care practices and total BASNEF score among studied patients (control and study groups) pre, post and follow-up after 3 months of the educational guidelines.

Total Knowledge	Total BASNEF score					
	Pre guidelines		Post guidelines		Follow up after 3 months	
	r	p-value	R	p-value	r	p-value
Total Knowledge						
Control(n=55)	0.105	.445	.282	.057	.184	.178
Study(n=55)	0.137	.320	.347	.009*	.445	.001**
Total reported foot care practices						
Control(n=55)	.256	.059	.301	.102	.197	.148
Study(n=55)	.108	.433	.655	.008*	.407	.002*

** Highly Statistically significant $p < 0.001$ *Statistically significant $p < 0.05$ Not significant $p > 0.005$

Table (7): Correlation between total foot care practices and total knowledge among studied patients (control and study groups) through the program phases.

Total reported foot care practices	Total knowledge					
	Pre guidelines		Post guidelines		Follow-up after 3 months	
	R	p-value	r	p-value	r	p-value
Control (n=55)	.222	.103	.366	.224	.285	.537
Study (n=55)	.139	.312	.304	.024*	.333	.000**

** Highly Statistically significant $p < 0.001$ *Statistically significant $p < 0.05$ Not significant $p > 0.00$

Discussion

Diabetic foot is the most frequent health issue among diabetic patients who require greater care and attention. Educational programs that employ health education concepts are effective at preventing the consequences of diabetes. One of the helpful patterns in health education and promotion is the BASNEF model, which combines the prior pattern and the behavioral intention model. The BASNEF model is a complete framework model used to examine behavioral change as well as define the factors that influence patients' decision-making. Owing to this model, patients start a new behavior when they recognize it will be beneficial for them (**Villarino et al., 2021**).

Concerning demographic characteristics of studied patients, the present study displayed that about three fifths of both study group and control group aged between 55- <60 with mean 57.41 ± 4.17 and 58.22 ± 3.75 years respectively. Also, the majority of both groups were females. The previous results were incompatible with **Jeihooni et al., (2019)** who achieved a study on 200 type II diabetic patients in Iran about educational intervention based on BASNEF model on self-medication behavior and reported that the average age of experimental group was (53.25 ± 8.42) and the average age of control group was (54.18 ± 8.13) and 58% & 55% of both groups were females respectively.

Regarding medical history of studied patients, the present study showed that approximately three quarters of the study group and majority of the control group had history of other chronic diseases while, majority and more than two thirds of study and control groups had family history of diabetes respectively. Also, more than three quarters and majority of study and control group didn't have history of smoking respectively and majority of study and control groups had high blood glucose levels respectively and slightly two thirds and more than two thirds of both groups suffering from diabetes for more than 5 years. These findings were consisted with **Hajipour et al., (2022)** who carried out a study in Iran on 100 elderly diabetic patients about effect of stage-matched educational intervention on behavior change and glycemic control and reported that, the average duration of the disease was (7.18 ± 4.21) years.

Concerning knowledge of studied patients; the present study clarified that there were highly statistically significant differences between study and control groups regarding total knowledge about type II DM, diabetic foot and total knowledge post educational guidelines and follow up after three months of educational guidelines implementation ($p < 0.001$). These

results were parallel to **Jeihooni et al., (2013)** who conducted a study in Iran on 50 type2 diabetic patients about BANSEF model based educational programs on blood sugar control and stated that three months following the educational intervention, the experimental group's average knowledge score significantly improved, while the control group exhibited no change. Also, these findings were reinforced by **El-Sayed et al., (2019)** who performed a study in Egypt about effect of an educational program on knowledge, practice, and self-efficacy of patients with type 2 diabetes and discovered statistically significant increase in overall mean knowledge scores from pre/post and from pre/follow up test (P value 0.000.). This might be relevant to the positive effect of the educational guidelines based on BASNEF model which enhanced the study group patient's knowledge and increased their awareness about the disease.

Additionally, the previous results were in the same line with **Chubbs, (2017)**, who conducted a study in Canada about primary care provider adherence to the Canadian diabetes association clinical practice guideline and stated that a significant enhancement in the intervention group knowledge mean score compared to the control group both immediately after the intervention and three months later.

This study demonstrated that more than two fifths of the study group had good total knowledge level pre-educational guidelines and increased to nearly three quarters and more than two thirds post educational guidelines and follow up after three months of educational guidelines implementation respectively. The previous results were consistent with **Lamadah et al., (2022)** who performed an empowerment educational intervention based on BASNEF model in Egypt for diabetic patients and showed that the mean knowledge score considerably raised among the intervention group compared to the control group. This might be due to the effectiveness of the instructional materials based on the BASNEF model in raising the study group's level of knowledge through group discussions, presentations, and booklet content.

Concerning reported foot care practices, the current study explained that there were a statistically significant differences ($p < 0.005$) between study and control groups regarding to (daily foot care, footwear, and foot inspection) post and follow up after three months of educational guidelines implementation. Additionally, there was a statistically significant difference between study and control groups in relation to total foot care practices ($p < 0.005$) post educational guidelines and follow up after three months of educational guidelines implementation. This was in the same line with **PourMohammad et al., (2021)** Who

accomplished a study on the self-care behaviors of type 2 diabetes patients in Iran using an educational intervention based on the theory of planned behavior and found that the intervention group's mean scores for overall self-care behavior and its components considerably rose in comparison to the control group immediately and three months after the intervention. This might be linked to increased patients' awareness regarding foot care and their need to prevent foot complications which resulted from providing them with the necessary instructions regarding daily observation of the foot.

Similarly, **Yingli, (2021)** who accomplished a study in China about effects of interactive education with conversation map in elderly diabetics on foot care behaviors and reported that, after 3 months of intervention, the experimental group's foot care behavior had improved significantly ($p \leq 0.05$).

Regarding studied patients total reported foot care practices level, the existing study portrayed that more than two fifths of the study group had satisfactory total foot care practices level pre-educational guidelines and improved to the majority post and follow up after three months of educational guidelines implementation. These results were supported with **Abdolabadi et al., (2017)** who studied educational intervention on barriers of living with diabetes among patients with type 2 diabetes mellitus: Application of the BASNEF model, and reported a significant increase in total self-care scores behavior immediately and three months after educational intervention. This improvement might be attributable to patients' motivation to exhibit these practices as a result of ongoing emphasis of the crucial importance of patients' practices in preventing or minimizing diabetic foot injuries throughout implementation of educational recommendations.

Also, these findings were in the with **Shaban et al., (2021)** who examined the effect of an educational intervention on self-care behaviors among diabetic retinopathy patients and found that the study group had significantly improved their self-care behaviors following the application of the educational intervention.

Concerning studied patients' attitude, the existing study demonstrated that there were highly statistically significant differences between study and control groups regarding total attitude. This disagreed with **Maleki et al., (2016)** who undertaken a study in Iran about training on preventative nutritional behaviors for type-2 diabetes females using theory of planned behavior and found that before the intervention, the participants had a negative attitude about foot care techniques, but immediately and three months later, a little improvement was noticed. According to the researchers' viewpoint, employing the

BASNEF model for educational guidelines sessions as well as question-and-answer as teaching approaches could modify diabetic patients' feelings and fears.

Concerning subjective norms, this study revealed that there were highly statistically significant differences between study and control group post and after three months of the educational guidelines. This finding was incompatible with **Zeidi et al., (2020)** who achieved a study on type 2 diabetic patients regarding a theory of planned behavior-enhanced intervention to promote self-care behaviors and found that the mean value for subjective norms upgraded in the intervention group post the educational intervention. In contrast **Tori et al., (2019)** who completed a study about BASNEF-based nutrition education on nutritional behaviors among elderly people with type 2 diabetes in Iran, and declared that subjective norms mean score elevated post intervention while not significant in control group. This might be related to the researchers were keen to identify how the family and society pressures interfered with the diabetic patients' healthy habits.

Concerning total enabling factors, the current study demonstrated that there were highly statistically significant differences between study and control group about total enabling factors post educational guidelines implementation($p < 0.001$). This result was in the same line with **Askari et al., (2018)** who accomplished a study in Iran on patients with type II diabetes and discovered a significant rise in the mean score of enabling factors in the experimental group. This could be relevant to the BASNEF model based educational guidelines which helped the patients to identify subjective norms as health services, alternative behaviors and medication compliance.

The present study illustrated that there was a statistically significant positive correlation between the study group total knowledge, total reported foot care practices and total BASNEF score post educational guidelines and after follow up of educational guidelines implementation($p < 0.005$). This finding was agreed with **Jeihooni et al., (2013)** who reported that there was positive correlation between studied patients' self-care practices and BASNEF model. This might be due to providing the diabetic patients with knowledge helped them to enhance health beliefs and positively affected attitudes, subjective norms and enabling factors toward foot care which was reflected in significant improvement of reported foot care practices.

The present study illustrated that there was a significant positive correlation between the study group total knowledge and total reported foot care practices post educational guidelines ($p < 0.005$) and after follow up of educational guidelines

implementation($p < 0.001$). This finding was in accordance with **Abid et al. (2022)**, who examined how an educational intervention affected the knowledge and self-care behaviors of diabetic retinopathy patients. Their findings revealed statistically significant correlations between the patients' total knowledge and their self-care behaviors. This might be due to the use of practical and theoretical sessions based on the BASNEF model resulted in raising awareness and improving practices in diabetic patients.

Conclusion

In the light of the current study results: BASNEF model based educational guidelines effectively improved knowledge, reported foot care practices, beliefs, attitude, subjective norms and enabling factors regarding foot care of type II diabetic patients who received the educational guidelines. So, the research aim and hypothesis were accomplished.

Recommendations:

Based on the result of the current study, the following recommendations are suggested:

- Developing awareness programs for all diabetic patients to enhance their knowledge, practices and behaviors regarding foot care.
- Distribution of the educational booklet to the Internal Medicine and Surgery outpatient clinics at Benha City Hospitals to be available to all diabetic patients.
- Further researches needed to be carried out: Implementing different models regarding foot care among type II diabetic patients and evaluating its effect on their knowledge and practices.

Study limitations

There were no limitations in this study.

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الملخص العربي

إرشادات تعليمية مستندة إلى نموذج *BASNEF* فيما يتعلق بالعناية بالقدم بين مرضى السكري من النوع الثاني

الخلفية: يحتاج مرضى السكري إلى رعاية خاصة لأقدامهم لأن سوء صحة القدم يمكن أن يؤدي إلى مضاعفات كبيرة بما في ذلك القدم السكري وآثارها (القرح والبتير)، والتي يمكن تجنبها من خلال التوجيه المناسب.

الهدف: تهدف الدراسة إلى تقييم الإرشادات التعليمية المستندة إلى نموذج *BASNEF* فيما يتعلق بالعناية بالقدم بين مرضى السكري من النوع الثاني

تصميم البحث: تم استخدام تصميم شبه تجريبي لإجراء الدراسة

مكان الدراسة: أجريت الدراسة في عيادتين من العيادات الخارجية وهي العيادة الخارجية للباطنة وعيادة الجراحة بمستشفى بنها الجامعي

العينة: تم استخدام عينة غرضية من 110 مريض سكري من النوع الثاني مقسمة الي مجموعتين متساويتين مجموعة الدراسة ومجموعة التحكم

الأدوات: تم استخدام ثلاث ادوات لجمع البيانات 1-استبانة المقابلة الشخصية، 2- استبيان ممارسات العناية بالقدم، 3- نموذج *BASNEF*

النتائج: كشفت الدراسة الحالية أن هناك تحسنا كبيرا في المستويات الإجمالية لمعلومات ، وممارسات العناية بالقدم ونتائج نموذج *BASNEF* لمجموعة الدراسة ، بعد وبعد ثلاثة أشهر من تنفيذ الإرشادات التعليمية مقارنة بالمجموعة الضابطة. بالإضافة إلى ذلك؛ كانت هناك علاقة ذات دلالة إحصائية بين نتائج نموذج *BASNEF* والمستوي الاجمالي للمعلومات وممارسات العناية بالقدم لمجموعة الدراسة بعد الارشادات التعليمية وبعد ثلاثة اشهر من المتابعة .

الخلاصة: أدى تنفيذ الارشادات التعليمية المستندة إلى نموذج *BASNEF* إلى تعزيز معلومات مرضى مجموعة الدراسة وممارسات العناية بالقدم ومعتقدات و اتجاهات والعادات الشخصية والعوامل التمكينية المتعلقة بالعناية بالقدم لمجموعة الدراسة.

التوصيات: توزيع كتيب تعليمي على العيادات الخارجية للباطنة والجراحة بمستشفيات مدينة بنها ليكون متاحًا لجميع مرضى السكر.