

The Foot Care Process of Diabetic Patients (With and Without Foot Ulcer) Attending A Tertiary Care Hospital in India

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Abstract

Diabetes Mellitus (DM) foot complications are a leading cause of morbidity in developing countries and prevalence of diabetes is expected to increase in the next decades in these countries. The aim of this study was to assess the knowledge about diabetic foot care among diabetic patients (with and without foot ulcer i.e. DFU+VE and DFU-VE) attending tertiary care hospitals (SGPGIMS, Lucknow) in India. This is a comparative study carried out from July 2013 to June 2014 based on questionnaires. The knowledge and practice scores, hypoglycaemia and diet score, and insulin administration and exercise score were classified as good if score $\geq 70\%$, satisfactory if score was 50-69% and poor if score was $< 50\%$. Among DFU+VE patients (200), 47.7% had good knowledge of foot care versus 52.3% had poor knowledge about foot care, 66.5% had good knowledge to treat hypoglycemia at home; 48.53% had good knowledge of insulin administration. In DFU-VE patients (200), 52% had good knowledge versus 48% had poor knowledge about foot care; 64.5% had good knowledge to treat hypoglycemia at home; 36.93% had good knowledge of insulin administration. Illiteracy and low socioeconomic status were significantly associated with poor knowledge and practice of foot care, hypoglycaemia and diet, and insulin administration and exercise in DFU+VE cases. This study has highlighted the deficiency of the knowledge of foot care among the DFU+VE and DFU-VE patients, underscores the need for an educational programme to reduce the diabetic foot complication.

Keywords: DFU+VE; DFU-VE; Foot ulcer; Foot care

Introduction

Diabetes mellitus (DM) is a metabolic disorder that is characterized by chronic hyperglycaemia; it is a common and potentially disabling chronic disease [1,2]. The condition is presently afflicting 194 million people worldwide and is estimated to rapidly increase to 333 million people in 2025 as a consequence of longer life expectancy, sedentary lifestyle and changing dietary patterns [2-4]. About 60% of the poorest countries in the world are in sub-Saharan Africa and this region will experience the greatest rise in the prevalence of diabetes in the next 20 year [3].

This rise in prevalence of DM is likely to bring a concomitant increase in its complications among diabetic patients. One important complication of DM are the foot problems; these complications constitute an increasing public health problem and are a leading cause of hospital admission, amputation of lower limb, pain and mortality in diabetic patients. In addition to causing pain and morbidity, foot lesions in diabetic patients also have substantial economic consequences, beside the direct costs of foot complications, there are also indirect costs relating to loss of productivity, individual patients' and family costs and loss of health related quality of life. The lifetime risk of a person with diabetes developing a foot ulcer could be as high as 25%, and it is believed that every 30 seconds a lower limb is lost somewhere in the world as a consequence of diabetes [5]. The prevalence of diabetic foot ulcer (DFU) ranged between 1.0% and 4.1% in the United States (US), 4.6% in Kenya, and 20.4% in Netherlands [6-8]. The International Diabetes Federation (IDF) estimates the total number of diabetic subjects to be around 40.9 million in India and this is further set to rise to 69.9 million by the year 2025 [9].

Some environmental factors like increasing urbanization, unhygienic conditions, poverty, frequent co-existing HIV infection,

barefoot walking, low income, and cultural practices have also been said to compound the situation [10]. People with diabetes are prone to develop foot ulcer, amputation and other lower extremity clinical abnormalities if they do not have good knowledge of foot care practice. Therefore, the aim of the study was to educate the diabetic patients, at primary level, about foot care, hypoglycaemia, diabetic diet, insulin administration and exercise to reduce the foot complications produced by the diabetes knowledge about diabetes and care of foot can reduce the foot ulceration and amputation of foot of the patients and preventing the foot ulcer. The related objectives are:

- (1) To assess the knowledge of diabetic patients about diabetes (symptoms, complication and foot complication)
- (2) To assess the knowledge of diabetic patients about foot care
- (3) To assess the knowledge of diabetic patients about hypoglycaemia.
- (4) To assess the knowledge of diabetic patients about diabetic diet.
- (5) To assess the knowledge of diabetic patients about insulin administration.

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- (6) To assess the knowledge of diabetic patients about non- weight bearing exercise.

Methods

Study-sample and setting

The research approach adopted for the study is comparative survey approach. The research design is qualitative non-experimental research design. The study was conducted in O.P.D. and in ward of endocrine surgery department at SGPGIMS, Lucknow. Diabetic sample size is limited to 400 and categorized into category1 [200 diabetic patient with foot ulcer (DFU+VE)] and category 2 [200 diabetic patient without foot ulcer (DFU-VE)].

Inclusion and exclusion criteria

The diabetic subjects have either foot ulceration or not. Subjects were excluded if they had severe peripheral vascular disease, dementia, non-diabetic or other conditions that would preclude active participation based on the investigator's judgment.

Outcomes and clinical assessment

The primary outcome was the knowledge about foot care to the diabetic patients, coming in the OPD of Endocrine Surgery at SGPGIMS. This study will help in educate the diabetic patients about how to care the foot, how to administer the insulin and regulate the diet and also making the diet chart according to blood sugar level as well as manage and regulate the blood sugar by doing exercise. It also educate the patients about how to wear the diabetic shoes, educate about not wearing the toes ring and motivate the patients for regular check up and follow the advice by medical officer.

Methodology

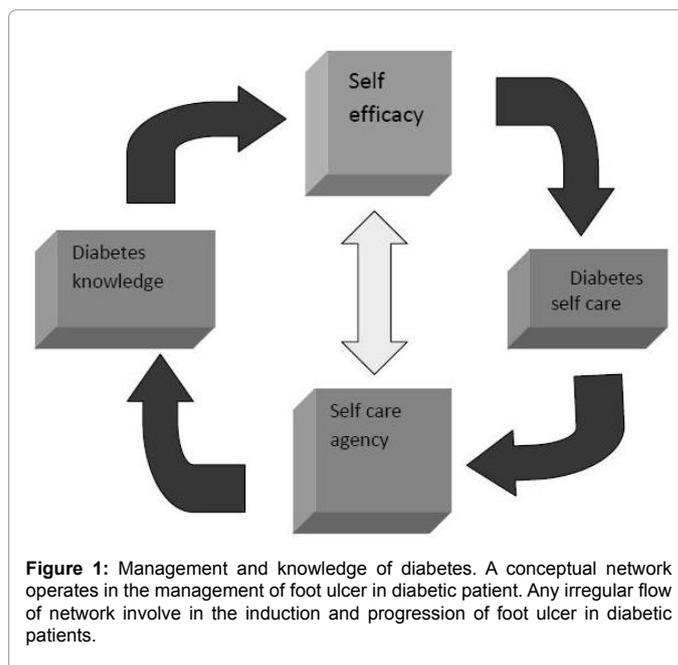
This is a comparative study carried out from July 2013 to June 2014. The brief questionnaires were administered by medical officers who also examined for predisposing factors to foot ulcer in the patients. The questionnaire consisted of questions on knowledge of foot care and current self-care practice (27 questions), hypoglycaemia and diet (9 questions), insulin administration and importance of exercise (17 questions); and each correct question was assigned one mark. Our questionnaire aids some additional information in some previous studies questionnaire [11,12]. The outcome variables of the study were knowledge and practice regarding foot care in diabetic patients.

Statistical analysis

Data obtained were analysed using SPSS statistical software version 16. Frequency and descriptive statistics were used to examine the general characteristics of the patients. The response to questions on knowledge, practice and barriers to foot care were analysed. Student t test was used to compare the means of the scores and the clinical parameter between DFU+VE and DFU-VE patients; and Chi square test was used to assess the significance of the responses and a *P* value of < 0.05 was considered statistically significant.

Results

We enrolled a total of 400 diabetic patients, 200 were DFU+VE and 200 were DFU -VE. In case of DFU+VE, 140 (70%) and 60 (30%) were males and females respectively while 116 (58%) were males and 84 (42%) females in DFU-VE patients (Table S1). According to the results of the interviews, patients face with different factors during



their experience and thus do a series of actions which could worsen or improve their disease management which is itself related to continuation of care. The findings indicated that the weak management of the disease leads to other diseases and vital complications like foot ulcer. They also showed that the strategies that patients adopt in regard to their foot ulcer are affected by their experiences, awareness and attitudes (Figure 1). The analysis of findings also showed that the experience of the disease and its management are undeniably related to the continuity of care and that disease management, disease experience and continuity of care are effective on the recuperation process of the wound.

Knowledge and practice of foot care

In DFU+VE patients, 47.7% had good knowledge of foot care versus 52.3% had poor knowledge about foot care while in DFU-VE patients, 52% had good knowledge versus 48% had poor knowledge about foot care. The distributions, of the response to questions related to the knowledge of foot care were shown in Table 1.

Hypoglycaemia and diet status

In DFU+VE cases, 66.5% had good knowledge to treat hypoglycaemia at home versus 33.5% had poor knowledge to treat hypoglycaemia at home; the 74% had good knowledge of diabetic diet versus 26% had poor knowledge of diabetic diet. On the other hand, in DFU-VE, 64.5% had good knowledge to treat hypoglycaemia at home versus 35.5% had poor knowledge to treat hypoglycaemia at home; the 74% had good knowledge of diabetic diet versus 26% had poor knowledge of diabetic diet. The responses related to hypoglycaemia and diet among the diabetic patients, (DFU+VE) and (DFU-VE), were represented in Table 2.

Knowledge of insulin administration and exercise

The 48.53% DFU+VE patients had good knowledge of insulin administration versus 51.47% had poor knowledge of insulin administration; 63.7% had good knowledge of exercise. The 36.93% DFU-VE patients had good knowledge of insulin administration versus

Questions related to knowledge and practice of foot care	DFU+VE		DFU-VE	
	Correct (%)	Wrong (%)	Correct (%)	Wrong (%)
Are you diabetic patient?	100	0	92	8
Do you know about diabetes?	68	32	88	12
How long you have diabetes (Below 25 years)?	100	0	94	6
Do you know about symptoms of diabetes?	72	28	82	18
Do you know the complications of diabetes?	56	44	66	34
Do you know about foot complication in diabetes?	60	40	62	38
Do you ever have ulcer in your foot?	24	76	46	54
Do you take advice from qualified doctor?	26	74	46	54
Does he/she an advice for foot care?	56	44	58	42
Do you inspect feet regularly?	54	46	64	36
Do you wash feet every evening regularly?	54	46	56	44
Do you wash feet with soap and luck warm water?	38	62	36	64
Do you properly dry in between your toes?	52	48	56	44
Do you keep feet clean and moist?	42	58	36	64
Do you use the moisturizing cream over feet?	40	60	34	66
Do you cut nails with sharp instrument?	36	64	20	80
Do you use the nail cutter?	64	36	74	26
Do you trim toes nails straight across?	44	56	62	38
Do you use the emir board to shape toe nails?	38	62	60	40
Do you measure your feet size when last you bought footwear?	86	14	60	40
Do you receive advice when last you bought footwear?	74	26	2	98
Did you ever inspect inside of footwear?	74	26	68	32
Do you regularly walk bare footwear?	50	50	58	42
Are you going to worship place bearing shocks?	18	82	24	76
Do you change your shocks daily?	46	54	70	30
Do you wear elasticized hosiery?	4	96	18	82
Do you wear toe rings?	58	42	30	70

Table 1: Distribution of the responses to questions related to the knowledge and practice of foot care among the diabetic patients [with foot ulcer (DFU+VE) and without foot ulcers (DFU-VE)].

Questions related to hypoglycaemia and diet	DFU+VE		DFU-VE	
	Correct (%)	Wrong (%)	Correct (%)	Wrong (%)
Do you know about hypoglycemia?	68	32	74	26
How to identify the symptoms of hypoglycemia?	66	34	68	32
Do you know how to treat hypoglycemia?	66	34	58	42
Do you know how to manage the hypoglycemia at home?	66	34	58	42
Do you plan your normal routine daily diet, according to modify insulin unit?	72	28	88	12
Do you manage the time interval between meal and insulin?	68	32	90	10
Are you able to identify food sources of carbohydrates?	64	36	76	24
Can you name the common food that should be avoided?	98	2	78	22
Did you know to substitute food from exchange list?	60	40	68	32

Table 2: Distribution of the responses to questions related to the hypoglycaemia and diet among the diabetic patients (DFU+VE) and (DFU-VE).

63.07% had poor knowledge of insulin administration; 59.6% had good knowledge of exercise. The queries and their responses were mentioned in Table 3.

Association of demographic factors with the knowledge and practice of foot care, hypoglycaemia and diet, and insulin administration and exercise

Seventy two (36%) DFU+VE and eighty-eight (44%) DFU-VE were below the age of 50 years. The mean age for DFU+VE and DFU-VE and DFU-VE were 55.74 ± 8.34 and 51.62 ± 13.85 respectively. Of 200 DFU+VE patients, 115 (57.4%) had no formal or primary education and 85 (42.6%) had a secondary or tertiary education; 61 (30.5%) had upper/middle socioeconomic status. However in case of DFU-VE, 106 (52.8%) had no formal or primary education and 94 (47.2%) had

a secondary or tertiary education; 82 (41%) had good socioeconomic status (Table S1).

In order to determine the impact of demographic factors on knowledge and practice of foot care, hypoglycaemia and diet, and insulin administration and exercise in DFU+VE patients, the categorical variables were dichotomized and the student t test was used to compare the mean of the scores. Poor education attainment and low socioeconomic status were significantly associated with lower the knowledge and practice score, hypoglycaemia and diet, and insulin administration and exercise in this study (Table 4).

Statistical relationship of different clinical parameters in diabetic patients (DFU+VE and DFU-VE)

The diabetic patients were significantly related to table 5 parameters

Questions related to insulin administration and exercise	DFU+VE		DFU-VE	
	Correct (%)	Wrong (%)	Correct (%)	Wrong (%)
Do you use insulin (Below 10 year)?	56	44	56	44
How long you are using insulin?	56	-	42	-
Do you know that how many type of insulin are there?	56	44	56	44
Do you know how to store the insulin?	64	36	62	38
Do you know to use the insulin?	52	48	50	50
Do you know about insulin syringe?	62	38	54	46
Do you know that how many unit of insulin to takes?	54	46	68	32
Do you know about safe site of insulin injection?	62	38	54	46
Do you know the right technique of insulin administration?	56	44	40	60
Do you able to administer insulin yourself?	52	48	60	40
Do you clean the site of insulin administration with spirit swab?	82	18	66	34
Do you know to alternately change the site?	72	28	60	40
Do you know after the insulin administration site should not be rubbed?	34	66	54	46
Do you walk regularly?	62	38	72	28
What duration you walk in a day (% of below 4 km)?	58	42	70	30
Do you doing any type of exercise?	42	58	54	46
Duration of that exercise (% of below 3 hours)?	42	58	54	46

Table 3: Distribution of the responses to questions related to the insulin administration and exercise among the diabetic patients (DFU+VE and DFU-VE).

Demographic factors	Knowledge and practice score	p value	Hypoglycaemia and diet score	p value	Insulin administration and exercise score	p value
Age						
<50	14.84		4.56		9.48	
≥50	14.39	0.58	4.27	0.39	9.37	0.74
Sex						
Male	15.57		4.83		10.79	
Female	15.28	0.37	4.53	0.42	10.65	0.40
Education						
None/Primary	15.48		5.81		9.87	
Secondary/Tertiary	17.53	0.005	4.56	0.043	11.16	0.003
Socioeconomic status						
Upper/Middle	17.91		5.94		11.36	
Lower	14.62	0.042	3.87	0.011	9.18	0.035

Table 4: Impact of demographic factors on knowledge and practice of foot care in DFU+VE cases.

Clinical Parameters	DFU+VE (mean ± SD)	DFU-VE (mean ± SD)	P value
Are you diabetic patient? (Q1)	1 ± 0.01	0.92 ± 0.27	0.042
Do you know about diabetes? (Q2)	0.68 ± 0.47	0.88 ± 0.33	0.016
How long you have diabetes? (Q3)	14.80 ± 2.94	9.54 ± 7.44	<0.001
Do you ever have ulcer in your foot? (Q4)	0.24 ± 0.43	0.46 ± 0.50	0.021
Do you take advice from qualified doctor? (Q5)	0.26 ± 0.44	0.46 ± 0.50	0.038
Do you measure your feet size when last you bought footwear? (Q6)	0.38 ± 0.49	0.60 ± 0.49	0.028
Do you receive advice when last you bought footwear? (Q7)	0.86 ± 0.35	0.60 ± 0.49	0.003
Do you wear elasticized hosiery? (Q8)	0.48 ± 0.54	0.70 ± 0.46	0.032
Do you plan your normal routine daily diet, according to modify insulin unit? (Q9)	1.34 ± 0.63	1.90 ± 0.42	<0.001
Do you manage the time interval between meal and insulin? (Q10)	1.36 ± 0.60	1.90 ± 0.42	<0.001
Can you name the common food that should be avoided? (Q11)	0.98 ± 0.141	0.78 ± 0.42	0.002
Do you know the right technique of insulin administration? (Q12)	0.46 ± 0.50	0.24 ± 0.43	0.021
How long you walk? (Q13)	1.62 ± 0.75	1.26 ± 0.88	0.030
What duration you walk in a day? (Q14)	0.28 ± 0.54	0.70 ± 0.84	0.004

Table 5: The relationship of different clinical parameters in Diabetic patients (DFU+VE) and (DFU-VE).

like Q1 ($p= 0.042$), Q2 ($p= 0.016$), Q3 ($p= <0.001$), Q4 ($p= 0.021$), Q5 ($p= 0.038$), Q6 ($p= 0.028$), Q7 ($p= 0.003$), Q8 ($p= 0.032$), Q9 ($p= <0.001$), Q10 ($p= <0.001$), Q11 ($p= 0.002$), Q12 ($p= 0.021$), Q13 ($p= 0.030$) and Q14 ($p= 0.004$). The other studied parameter showed no significant result (Table 5).

Discussion

The result of this study showed that a greater proportion of diabetic patients had a poor knowledge of diabetic foot care. The lack of

knowledge foot care in our study is consistent with findings by other investigators worldwide [12-16].

We also found that the DFU-VE patients (52%) had good knowledge of foot care in comparison to DFU+VE patients (47.7%). The status of diet and how to treat hypoglycaemia were approximately similar in both groups. However, DFU+VE patients had good knowledge of insulin administration in comparison of DFU-VE patients. A network of different pathway and various environmental factors are responsible

for the progression of the benign to lethal stages of diabetes. Therefore, the lack of knowledge of foot care, by several means, responsible for formation of ulcer in different diabetic patients.

In the present study, the patients having poor education and in low status significantly had lower knowledge of foot care while gender and age differences were not significantly associated with the knowledge of foot care. Our study had same concordance with previous studies in India, Iran and Pakistan [13-15]. The knowledge of appropriate foot care has been suggested to be positively influenced by patient education which in turn reduces the risk of foot ulceration and amputation in high-risk diabetics [17]. The association between education and knowledge may be due to the fact that, educated patient were able to read and understand some of educational supportive materials and also use information technology to obtain more information about the disease.

In the present non-experimental survey based study, although, patients recruited on the basis of presence of diabetes yet patients either had foot ulcer or they don't have ulcer. This is the difference of this study that that of other previous studies [12-16]. Patient's unawareness about the presence of diabetic disease, disease process, the normal level of blood sugar, the effect of medicinal diet, type of nutritional diet, care process for the foot and preventing the ulcer [13,18]. The likelihood for the occurrence of ulcer following the diabetic disease, presence of the diabetic association, and access to training classes results in the weak management of the disease and accordingly in the deterioration of the foot ulcer. The rate of amputation among the patients who suffer from the diabetic foot ulcer syndrome and have a weak control over their blood sugar is much higher [19]. Women and those above the age of 50 were less knowledgeable about foot care, although these associations were not statistically significant. Some factor also influence the poor knowledge of foot care is that in some third world countries due to socio-cultural beliefs women are not allowed to attain higher educational status compared with their male counterpart in the family, eventually resulting in women having less knowledge of DM foot care.

Some of the inadequacies of foot care practice in our subjects include non-inspection of ulcer inside foot (76% DFU+VE versus 54% DFU-VE patients), non-inspection of their feet (46% DFU+VE versus 36% DFU-VE), improper washing of feet with soap and warm water (62% DFU+VE versus 64% DFU-VE), and no advice from doctor (74% DFU + VE versus 54% DFU-VE). The poor practice of foot care in this study may be attributed to the lack of knowledge among the respondent as 52.3% DFU+VE versus 48% DFU-VE patients had poor knowledge of foot care.

The deficiency in the knowledge may be due to poor communication between the doctors and the patients and also lack of counselling by the doctors and nurses as result of busy clinic schedule. Thus, patient education on the prevention of foot ulceration is imperative and should be incorporated into the routine care of patients with diabetes both in the hospital and in the community. Time must be allotted to communication, information and education during clinic sessions [20]. Furthermore, the education of physician is highly imperative to complement and reinforce the behaviours of patient with regards to foot care; they need to learn and imbibe the skills of counselling and risk assessment. Our study has been able to determine the knowledge and practice of foot care among diabetic patients, with and without foot ulcer, in Indian.

Strengths and Limitations of the Study

The results of this study are a wakeup call on the clinicians, nurses

and researchers etc. (a diabetic team) to establish a patients and diabetic team friendly educational programmes that will enhance and sustain the good knowledge and practice of foot care. The study has unique strengths in which different clinical parameters were questioned in diabetic patients (with and without foot ulcer). The limitation of this study was that it is centred to a specific tertiary care hospital (SGPGIMS, Lucknow) in India, and only in limited number of samples.

Conclusions

In conclusion, the knowledge and practice of foot care among diabetic patients (with and without foot ulcer) in study were poor. The various pathways and factors contribute to recuperation of the diabetic foot ulcer. The most important ones are the disease experiences and disease management and also the continuity of caring. Attending to the latter point and having team therapy with a systematic program and continuous training for the patients alongside establishing specialist care centres for diabetic patients and employing trained nurses with specialty in foot diseases lead to the proper management of the disease and further participation from patients which consequently play a significant role in the recuperation of the foot ulcer syndrome.

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