Impact of foot care program implementation in reducing diabetic foot complications among patients attending a single Diabetes Centre

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Abstract

Background: Diabetic foot is a serious complication that may result in limb loss. The aim of the study was to determine the impact of a diabetic foot care and education program on the prevention and outcome of diabetic foot complications in our main diabetic center in Sudan.

Patients and methods: This is a prospective study performed in Jabir Abu Eliz Diabetic Centre (JADC), Khartoum, Sudan, from Jan 2009-Dec 2012. The target population was diabetics without foot ulcer attending the diabetic foot screening and prevention clinic. A total of 624 out of 2500 diabetic patients without foot ulceration seen in foot care section were randomly selected if they had 4 years or more follow up. Patients were given a standard education on diabetes control and foot care including tests for both neuropathy and ischaemia in addition to local foot problems. Patients were followed up regularly every 6 months in the clinic for a minimal of 4 years.

Results: A total of 624 diabetic patients were contacted. The male to female ratio was 1.2:1. The mean age was 52 years SD 12 and the age range from 20 to 80 years. The majority of patients (94.2%) were Type 2 diabetes (n=586). Seventy seven per cent of patients (n=480) had diabetes for more than 5 yrs. More than half the patients (59.3%) had 4 or more foot care sessions, while the rest had 1-3 session after the primary assessment. According to Simple Staging System (SSS) most of the patients (71.8%) (n=448) had at least one risk factor of foot ulceration (neuropathy, ischaemia, callus, deformity and oedema) and 21.8% were staged as high-risk group with more than one risk factor.

Seventy two per cent of patients (n=449) had one or more of the chronic complications, the major ones being neuropathy in 56% (n=351), ischemic symptoms in 24% (n=149), nail complication in 23% (n=143), blisters in 10% (n=62) , callus with a minor hidden foot ulcer in 10% (n=63), foot deformity in 3% (n=19). The rate of minor toes amputation was 3.5% and major amputation 2.9% (n=18).

Seventy seven per cent of patients claimed that they will seek urgent medical advice if encountered any foot problem, however only 45.5% did when actually had a minor foot problem. Among several factors studied to see patient compliance; the higher the level of patient primary education was the most significant factor ($p<0.02$) the more educated patients reporting earlier.

Conclusion: Patient education and regular foot care for diabetic were effective in reducing lower extremity complications, both minor and major lower extremity amputation. There is poor compliance of patients with follow-up and the main cause of poor compliance was unavailability of nearby service.

Introduction:

Several clinical and financial models have indicated that there is a potential for significant reduction in morbid events and costs when prevention programs are implemented. Multispecialty clinical programs have reported a decrease in amputation, re-amputation, ulceration, hospitalization, length of stay, and missed work days in diabetic foot patients. [1] The goal of the program was to prevent diabetes related lower extremity complications and was based on the implementation of systematic protocols for foot screening, prevention, and treatment of complications. We hypothesized that education, early identification of risk factors for ulceration and amputation, aggressive preventive measures, and standardized wound care protocols would decrease the incidence of foot complications and thereby reduce hospitalization and lower extremity amputation rate among patients with diabetes. The aim of the study was to determine the impact of a diabetic foot education program and foot care on the prevention and outcome of diabetic foot complications in JADC.

Patients and Methods:

JADC Khartoum was established in 1998 as multidisciplinary outpatient clinics with emphasis in the diabetic foot care and prevention. The center receives between 150 – 200 patients with diabetic foot ulcers per day with an average of 10 – 15 new cases. The Foot Care Clinic was established in JADC in 2004 for those diabetic patients attending the medical clinic without foot ulceration. The goal of the clinic was to prevent diabetes related lower extremity complications and was based on implementation of systematic protocols for foot screening, prevention, and treatment of complications. The value of Diabetic Foot Care Clinic has to be verified through evaluation of its impaction on the outcome of diabetic foot.

At the clinic patients go through focused history taking, physical examination, investigations, management as indicated, and education. All data are documented in a predesigned patient records data sheet. The history included personal data, diabetes duration, treatments received, and methods of control, history of previous foot complications, any encountered foot injury and measures taken by the patient or care givers. A staff podiatrist nurse conducts full examination of the foot for any deformity, callus deposition, inter-digital fungal infection. Neurologic assessment was performed clinically and by using a 10 g monofilament test (5.07) Semmes-Weinstein hair for sensory neuropathy and was rated as either positive or negative. Ischemia was assessed using Doppler examination to measure the ankle brachial pressure index according to the following criteria: >0.9 was considered adequate perfusion and <0.9 inadequate limb perfusion.

Patients receive all necessary interventions for any encountered problem by a trained podiatrist. If there is any ulceration discovered then the patient is directly referred to the Surgery Clinic for further management. Education module includes diabetes control, foot care, and foot wear. Patients then referred to the adjacent shoe-maker within the center. All patients were followed equally in the diabetic outpatient clinic and were advised on good glycemic control.

Patients were followed up for a mean of 36 ± 7 months after admission to the study using a formulated questionnaireand later by telephone interview about compliance and patient response to complications. A comparison was done between those who were compliant attending four or more sessions versus those attending one session. The following indices were analyzed: age, sex, duration of diabetes, education level, degree of neuropathy, ischemia, foot deformities, minor and major extremity amputations.

Data entry was performed using the Statistical Package for Social Sciences, version 17.0 (SPSS for Windows).

Results:

The total number of patients studied was 624; the male to female ratio was 1.2:1.0. The mean age was 52±12 years with a range of 20 to 80 years.

Seventy seven per cent of patients were resident in Khartoum. Eighty five per cent of patients (n=530) had some formal education and 15% were illiterate. 94.2% of patients (n=588) had type 2 diabetes. Most of the patients had diabetes for more than 5years (76.6%) (n=480). Sixty three per cent of patients were on oral hypoglycemic agents (n=393), 26% on insulin and 11% were on diet control.

Twelve patients (1.9%) had previous amputation, (0.7%) major amputation (n=4), and (1.2%) minor amputation.

Sixty per cent of patient sattended four or more foot care sessions, 8% had 3 sessions,14% two and 18% one session.

Seventy seven per cent of patients (n=480) claimed that they will seek urgent medical advice if they had foot complication, but only 45.5% actually did so.

According to the simple staging system (SSS),72% of the patients (n=449) had at least one risk factor of foot ulceration and 22% were high-risk group (n=131). Seventy two per cents (n=449) had one of the chronic complications, neuropathy in (56.3%) (n=351, ischemia in 24% (n=150), nail complication in 22.6 (n=141), a blister in 10% (n=63), callus with underneath minor foot ulcer in 10% (n=63) and foot deformities in 2.6% (n=16).

On follow up for a mean duration of 36 ±7 months the prevalence of foot ulcer among the study population was 9.6% (n=60), of whom 3.5% (n=21) ended with minor amputation and 2.9% (n=18) with major amputation; all were diabetic for more than 5 years. Eight patients had major amputation due to critical limb ischemia with severe sepsis.

Discussion:

Studies from several countries have shown that increased awareness of diabetic foot care, as well as its prevention and proper management, resulted in a 50% reduction in major amputation rates. However, those studies are reported from developed countries. [2] Few developing countries have implemented such a program, although they have a higher incidence of diabetes and diabetic foot complications.[3, 4]

Prevalence of foot ulceration among diabetic patients attending foot care clinic was 9.6%. There is great variation in the literature with regard to the prevalence of ulceration among general diabetic population ranging from lower than 1% to as high as nearly 12%. [5,6] Diabetes care like other health care provision in Sudan suffers from limited budget allocation, lack of trained staff, patient unawareness and high cost of treatment.[7] Achieving a prevalence rate within the recognized international figures indicates the efficiency of foot care program in our institute. Early identification of risk factors, prompt recognition and proper intervention on high risk patients are the best way to prevent ulceration and its devastating consequent complications.

In 1980 the rate of major lower extremity amputation in patients admitted to Khartoum Teaching Hospital with diabetic foot ulcers was 38%. A similar rate of amputation was consistently being reported up to the year 2000.[8] The reported rate for major lower limb amputation in JADC was 14% which included all patients attending the outpatient clinic with foot ulcers from various regions in the Sudan. In this study the rate of minor and major amputation in those diabetic patients without foot ulcers in a follow up period for a minimal of 36 months was 3.5% and 2.9% respectively. Although the incidence of lower extremity amputation has shown a great worldwide and even nationwide, variation, we believe that the rate achieved in this study is nearly similar to rates obtained by many studies in developed countries,[9, 10, 11] a finding which reflects the positive impaction of foot care program on the final outcome of diabetic population at risk. It was reported that education ensures both knowledge and change of behavior towards prevention of foot complications and early reporting of foot problems. [12] Lavery et al. found that implementing a lower extremity disease management program consisting of screening and treatment protocols for diabetic members in a managed care organization decreased the incidence of amputations by 47.4%.[2]

In our study, there is poor compliance of patients with follow-up. Only 31.0% of patients had regular

follow- up which is low in comparison with other studies from developed world where 47%.[13] and 71%.[14] compliances were reported. The positive results in this study with significant reduction in both minor and major lower extremity amputation could be due to the fact that many of the direct inflicting causes could easily be avoided and were easily dealt with if patients presented earlier. Many of the direct inflicting causes were avoidable. Walking barefoot or with slippers is a common practice in a hot tropical climate. This usually predisposes to sharp objects injuries, often ignored due to the neuropathy but more importantly the lack of knowledge on initial management of wound care. Patients usually report late with a limited chance to save toes or limbs. Traditional management using herbal medicine and cautery are often being practiced in some communities.[3]

The advantage of such foot care sessions is to alert patients to simple facts and early manageable actions that could make all the difference.

The situation is different in the developed world where the underlying chronic disease with advanced neuropathy and major limb ischemia were the main causes. The effectiveness of the educational programs in the developed world is rather controversial. There was no evidence that this program of targeted education was associated with clinical benefit in this population when compared with usual care. The usefulness and optimal delivery of education to such a high-risk group requires further evaluation.[15] Interventions designed to reduce risk factors for lower extremity amputations positively affected patient self-foot-care behavior as well as the foot care given by health care providers and reduced the prevalence of lower extremity clinical disease in patients with diabetes.[16]

The American Diabetes Association recommended strands for diabetes care of a comprehensive annual foot examination.[17] in addition to patient education to prevent or delay diabetes complications.[18,19] Primary foot inspection of major components like neuropathy and ischemia for diabetics by physicians and primary health care providers is lacking even in countries with established services.[20] These results suggest that, in the absence of concurrent changes in the health-care delivery system and strategies for influencing attitudes toward self-care, education alone is ineffective.[21]

We conclude that regular foot care for diabetics was effective in reducing lower extremity complications. Educational programs have to be tailored to each community and address the specific issues related to the patient education, health system delivery and foot care. The direct inflicting injuries in our setting which is preventable should be equally addressed with the holistic approach of diabetes care.

Limitations of this study include that we didn't calculate the age adjusted rate of ulceration/ amputation; a fact that may rather validate the foot care program. Also, the rate of amputation among those who developed ulcers from the study group remains high; a finding that necessitates an in depth analysis to identify the cause behind this.

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