

Evaluation of the efficacy of integrative programs in improving diabetic foot ulcers' outcomes: A cross-sectional study

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INTRODUCTION

Worldwide, the number of patients that live with diabetes mellitus is rapidly increasing and attributed to the combined effects of population ageing, increasing levels of sedentary lifestyles and obesity, as well as longer life expectancy among patients with diabetes, which are

Background: Treatment of a diabetic foot is a principal step in rehabilitative approaches to the complications of diabetes mellitus. Use of integrative educational courses for diabetic patients is dependent on several factors such as cultural entities of the population, patient perceptions of classes, and their previous trainings about diabetes and related complications. The aim of this study was to determine the efficacy of integrative programs to improve diabetic patients' outcomes for wound care.

Methods: We included 100 patients with diabetic wounds from August, 2014–December, 2014. Resources in this study included educational classes, brochures, and pamphlets. We implemented the educational course for three months in 50 patients and compared the results with 50 controls who received no educational course. The educational course was conducted over a three-month period and we evaluated reduction of HbA1C, fasting blood sugar (FBS), 60-second Diabetic Foot Screen score, STONES (Size, Temperature, Os [bone], New areas of breakdown, Exudate, erythema, edema, Smell) and NERDSS (Non-healing wound, Exudative wound, Red and bleeding wound, Debries in the wound, Smell form the wound) parameters implemented for evaluation of infectious diabetic wounds.

Results: We followed STONES and NERDS changes (positive to negative) in 42 (84%) patients from the intervention group and 21 (42%) control group patients ($P=0.001$). Reduction in the 60-second Diabetic Foot Screen score was 34 (68%) for the intervention group and 24 (48%) in the control group ($P=0.03$).

Conclusion: Possibly the use of interventional educational programs is effective in reduction of harm in patients with diabetic wounds, which will lead to decreased infections and better dynamic conditions.

Keywords: wound care, diabetes, education

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attributable to improved clinical care ¹. Diabetes is an endocrinological disease associated with a range of complications and comorbidities that include retinopathy and blindness, nephropathy, chronic renal failure and end-stage renal disease, cardiovascular diseases, peripheral neuropathy, and lower extremity amputations due to diabetic ulcers. These complications shorten the life expectancy of

affected people and cause physical decline, which result in disability ².

Chronic wounds, particularly of the diabetic foot, are a major burden for health services responsible for health care among diabetic patients ³. These usually develop as a consequence of other diabetic complications such as vascular involvement or neuropathies ⁴.

A higher burden is expected, particularly in patients with infectious diabetic wounds that may result in gangrene and other problems which lead to loss of the extremities and result in numerous disabilities for diabetic patients ⁵⁻⁷. Preventive interventions can reduce the burden of diabetes-related complications.

Treatment of the diabetic foot is a principal step in rehabilitative approaches to the complications of diabetes mellitus ⁸. Patients and physicians may contribute to the effective implementation of clinical guidelines in terms of establishing a partnership and shared decision-making via education about the course of the diabetic foot and related treatments.

Use of such integrative educational courses for diabetic patients is dependent on numerous factors such as cultural entities of the population, their perceptions of the classes, and previous trainings about diabetes and related complications ^{9,10}. In Asian countries, cultural problems and related issues are important topics that must be respected in educational courses and during implementation of other therapeutic modalities ^{11,12}.

We took into consideration the importance of implementation of integrative approaches to reinforce other preventive and therapeutic approaches that reduce the burden of the diabetic foot. This study aimed to determine the efficacy of integrative programs to improve diabetic patient outcome for wound care in our diabetic health care clinic.

PARTICIPANTS AND METHODS

We included 100 patients with diabetic wounds in this study, which was conducted from August 2014 until December 2014. All participants were known, established cases of diabetes mellitus according to existing medical documents. The resources in this study included educational classes, brochures, and pamphlets. This interventional trial received the approval of the Ethical Committee in our

regional center. We implemented the educational course for three months in the intervention group that consisted of 50 patients and compared the results to a control group of subjects who received no educational course. Both groups received conventional treatments. The authors provided reimbursement for this educational course which was free for patients. This study followed the principles of the Declaration of Helsinki and all participants provided written informed consent.

We conducted the interventional training course over a three-month-period and evaluated reductions in HbA1C, fasting blood sugar (FBS), in addition to STONES (Size, Temperature, Os [bone], New areas of breakdown, Exudate, erythema, edema, Smell) and NERDS (Non-healing wound, Exudative wound, Red and bleeding wound, Debris in the wound, Smell) from the wound parameters (implemented for evaluation of infectious diabetic wounds). NERDS included non-healing wounds, exudative wound, red and bleeding wound, and debris. STONES included increased size, increased temperature, Os (probes to or exposed bone), new areas of breakdown, erythema/edema, exudates, and smell. We considered these two variables as positive or negative. A score of ≥ 3 was considered positive, whereas < 3 was considered negative for NERDS and STONES parameters. These indices demonstrated the presence or absence of a wound infection and indicated treatment response in the patients. All patients in the control and intervention groups received the proper treatment. A specialist in infectious diseases and a surgeon performed all assessments. The 60-second Diabetic Foot Screen was performed for all patients.

We measured the reduction in the 60-second Diabetic Foot Screen as an index of response to treatment. This tool enables the clinician to screen persons with diabetes in order to prevent or treat diabetes-related foot ulcers and/or limb-threatening complications. Combining the results from different parameters identified by the 60-second Diabetic Foot Screen would allow the clinician to identify pathologies and/or care deficits ¹³.

We divided the patients into an intervention and a control group, including those with and without reduction of ankle brachial pressure index (ABPI). FBS and HbA1C were considered to be two biochemical markers of response. We considered reduction to normal levels in these two factors as

treatment response.

Other variables included age, gender, wound duration, diabetes duration, and presence of other diabetes complications. As a final step, we checked all variables in the patients and compared the results with initial findings. The evaluation was performed by a physician specialist in infectious and tropical diseases who had no interest or profit in the study. Main outcome measures included HbA1C and fasting blood sugar levels, STONES and NERDS indices, and the 60-second Diabetic Foot Screen. These variables were checked at the beginning of the study and after three months. The Version 13 of SPSS (SPSS Inc., Chicago, IL, USA) software was used to compare the differences in the means and frequencies as well as to determine the statistical significance.

RESULTS

As shown in Table 1, patients' ages, duration of diabetes and wound duration were similar across both groups in an attempt to reduce their confounding effects ($P>0.05$). Both groups had a mean age of approximately 50 years. All subjects had sufficient literacy; illiterate patients were excluded. The mean duration of diabetes was 5 years and the duration of diabetic foot wounds was 5 months.

The study indicated that included NERDS and STONES, reduction in the 60-second Diabetic Foot Screen score, FBS, and HbA1C levels significantly improved in the intervention group compared to the control group (Table 2) which showed the efficacy of the interventional educational program.

DISCUSSION

Patients with diabetes and high-risk foot conditions should be educated about risk factors and appropriate management. First, a non-judgmental assessment of the person's current knowledge and care practices should be obtained. At-risk patients should understand the implications of the loss of protective sensation, the importance of foot monitoring on a daily basis, and proper foot care. Educating diabetic patients about foot care in a home-based setting could enable the home healthcare clinician to provide information that may help reduce the risk of ulcerations and amputations.

According to the obtained results, it may be concluded that the use of interventional educational programs is effective for patients with diabetic wounds and can lead to decreased infections, better dynamic conditions, and improved glycemic control. Implementation of these complementary interventions can increase the efficacy of conventional therapeutics in diabetic patients who suffer from overwhelming complications of diabetes. In terms of the positive efficacy observed with this interventional educational course, we propose that further studies compare the effectiveness of these programs with other non-medical treatments. However, comparison with conventional therapeutics may be problematic due to ethical considerations.

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Table 1. Baseline characteristics in the intervention and control groups.

| | Intervention | Control | P |
|-----------------------------------|--------------|-----------|-------|
| Age (years) | 49.9±10.2 | 49.9±10.1 | 0.918 |
| Gender, male (%) | 30 (60%) | 25 (50%) | 0.369 |
| Duration of diabetes (years) | 5.9±3.8 | 5.5±2.9 | 0.882 |
| Duration of wound (years) | 5.3±3.1 | 5.1±2.7 | 0.731 |
| Others diabetic complications (%) | 14 (28) | 13 (26) | 0.873 |

Table 2. Improvements in outcome measures in the intervention and control groups.

| | Intervention group | Control group | P |
|---|--------------------|---------------|-------|
| STONES and NERDS change (positive to negative) | 42 (84%) | 21 (42%) | 0.001 |
| Reduction in 60-second Diabetic Foot Screen score | 34 (68%) | 24 (48%) | 0.03 |
| FBS* | 39 (78%) | 22 (44%) | 0.001 |
| HbA1C | 43 (86%) | 25 (50%) | 0.001 |

*FBS: Fasting blood sugar.

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