A Cross-sectional Study of Depression and Self-Care in Patients With Type 2 Diabetes With and Without Foot Ulcers

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Abstract
Depression has been recognized as a risk factor for foot ulceration in persons with diabetes mellitus. Using convenience sampling methods, a cross-sectional study was conducted among persons with type 2 diabetes treated in a diabetic foot clinic in Sao Paulo, Brazil between February 2010 and December 2011. One hundred (100) patients (average age 62 years, range 38 to 83 years), 50 with a foot ulcer and 50 at risk for developing a foot ulcer, participated. Symptoms of depression were assessed using the Beck Depression Inventory (BDI), where scores increase with severity; and patients were interviewed about foot self-care behaviors. Average BDI scores among patients with an ulcer were higher (mean 20.37; range 1 to 42) than those of patients that had not developed a foot ulcer (mean 15.70; range 2 to 49) \( (P = 0.030) \). Self-care behavior was not significantly different between the two groups. Severe depression \( (P = 0.049, \text{OR}= 6.56 \text{ CI 1.01–42.58}) \) and male gender \( (P <0.001, \text{OR}=14.87 \text{ CI 3.83–57.82}) \) were associated with the presence of a foot ulcer. Despite reported adequate self-care behaviors, patients with an ulcer had more symptoms of depression than patients who were at risk for developing a foot ulcer. Studies examining cause-and-effect relationships between these observations and the potential role of depression interventions are needed. The results of this and other studies suggest depression screening is important in patients with diabetes mellitus and foot ulcers.

Keywords: depression, self-care, diabetic foot ulcer, type 2 diabetes mellitus

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The risk for ulcer development in the feet of patients diagnosed with diabetes mellitus (DM) is estimated to be 15%; in turn, diabetic foot ulceration is an important risk factor for lower extremity amputation. In patients with diabetes, foot ulcers are caused by a combination of risk factors, such as diabetic neuropathy, peripheral vascular disease, deformity, and trauma, all associated with the chronic complications of diabetes.1,2

A few years ago, the diagnosis of depression was added as another risk factor. A prospective cohort study3 of 253 patients showed among adults with their first diabetic foot ulcer, one third had depression and a mortality risk three times greater in comparison to patients who were not depressed. In a prospective study of elderly patients \( (N = 80) \) with type 2 diabetes, Monami et al4 demonstrated the association between depressive symptoms and the occurrence of foot ulcers and their rate of healing. A prospective study Gonzalez et al5 among 333 patients with diabetic neuropathy found depression was associated with the first (but not subsequent) ulcer. Results of a prospective study by Williams et al6 showed the risk of having a foot ulcer in patients with type 2 diabetes with no previous ulcer \( (N = 3,474) \) was two times greater among depressed patients when compared to the patients without depression. Thus, the literature shows that in patients with...
diabetes, depression is associated with higher occurrence, recurrence, and nonhealing of ulcers. A systematic review addressing complications of diabetic foot, behavior, and psychology revealed the incidence of amputation is high, possibly related to the severity of the disease and/or the absence of foot self-care behaviors in patients with diabetic neuropathy.

A descriptive cross-sectional study conducted via questionnaires mailed to patients with diabetes (N = 45) that defined foot self-care behavior as the preventive action implemented by the patients themselves aiming to minimize the risks of foot lesions that can result in infection and amputation showed such behavior is more frequently adopted by individuals who recognize their responsibility in the health process. Also using questionnaires, a cross-sectional study by Anselmo et al evaluated 60 patients with diabetes at risk for ulceration. Foot self-care techniques were found adequate in 90% of the patients, which is different from results of a prospective study conducted among 668 patients with type 2 diabetes in which 23% of the patients did not examine their feet.

Bakker et al published practical guidelines on foot care and prevention of foot ulcers that included healthcare practices for patients at risk for foot ulcers such as daily foot inspection, regular washing of feet, careful drying of feet, the need for another person skilled in foot inspection, avoiding walking barefoot indoors or outdoors, removing corns and calluses, using lubricating oils or creams for dry skin, cutting nails straight across, and daily inspection and palpation of the inside of the shoes.

Until now, few studies have simultaneously investigated the role of depression symptoms and self-care behaviors in patients with diabetes and lower limb complications. This realization encouraged the authors to evaluate depression and self-care in patients with and at risk for foot ulcers. The objective of this descriptive study was to evaluate and compare the levels of depression between patients with type 2 diabetes who practice foot self-care and have an ulcer to their counterparts with feet at risk for ulceration.

Methods

Sample size. A pilot study was conducted to determine the size of the representative sample to be studied. Ten (10) patients from each group, foot at risk for ulceration and active foot ulcer, were included to determine the minimum sample size able to detect differences using two research tools — the Beck Depression Inventory (BDI) and a self-care questionnaire — based on a statistical power of 80%. The minimum number was estimated to be 46 patients for BDI and 48 for foot self-care.

Design and study population. This cross-sectional study with a convenience sample was approved by the Local Ethics Committee under the number 675/2008. The study was conducted between February 2010 and December 2011. Patients were recruited consecutively as they sought care until researchers achieved 50 patients in each group for a total of 100 adult patients.

Inclusion and exclusion criteria. The inclusion criteria were: adult patients, both genders, with type 2 diabetes mellitus under follow-up in the Diabetic Foot Clinic at the University Hospital, University of Campinas. Patients who were unable to complete the questionnaire were excluded. Study participation was voluntary.

Instruments. BDI. The BDI, validated in the Portuguese language, was used to evaluate depression. This scale is composed of 21 items, all of which evaluate symptoms and attitudes. Responses vary in score from 0 to 3. The depression classification criteria were: 0–9 (minimal), 10–16 (mild), 17–29 (moderate), 30–63 (severe). At the same time, the BDI scale can be divided into two subgroups: the first 13 items address cognitive-affective symptoms, the remaining eight address somatic complaints and performance. The trust estimates of BDI based on Cronbach’s coefficient revealed values ranging from 0.77 to 0.92 and α = 0.85 in a medical-clinical sample of individuals with diabetes mellitus type 2, which can be interpreted as satisfactory. This instrument was selected for use based on this validation and adaptation to the Portuguese language because it is a psychological test broadly used in clinical and academic contexts. The participants completed the questionnaires on their own in the presence of a psychologist who could provide test-taking instructions and address concerns.

Self-care assessment. Self-care behavior regarding regular foot care was evaluated using a 10-item, yes/no questionnaire as follows: adequate washing and drying of the feet, moisturizing, straight line nail-cutting, cuticle removal, wearing adequate shoes, before-wear shoe inspection, not using abrasive materials, and not walking barefoot. This is not a validated instrument; the questions were developed in a recent study published by Anselmo et al. The patients were asked about...
the presence or absence of foot self-care behavior — eg, “Do you perform self-examination on your feet?” Questions were scored 0 (adequate) or 1 (inadequate). Therefore, on the example listed, if the patient answered “yes,” this item would receive a 0, because it represents an adequate behavior of foot care, and if the answer is “no,” 1 point is given, representing inadequate foot care. The final scores ranged from 0 to 10 (10 equals worst care) and were classified 0 = excellent, 1–5 = satisfactory, and ≥6 = inadequate.9

**Interview.** A structured interview was conducted in addition to examining medical records to assess general information regarding gender, age, schooling, remedies, and medical diagnosis, as well as clinical data such as time since the diagnosis of diabetes, diabetic foot assessment, and HbA1c levels. The structured interview was conducted by the main researcher, who solicited and documented the participant’s answers. All data were noted in an interview guide using paper and pen. The research protocols and the instruments used were stored and kept confidential, guaranteeing privacy and respect toward confidentiality.

**Statistical analysis.** Data were entered and analyzed using SPSS, version 16.0 (SPSS, Chicago, IL) for Windows. Descriptive and frequency analyses were performed using mean, median, standard deviation, minimal and maximal values, and percentages. The association between categorical variables was analyzed using the chi-square or Fisher’s exact test. The Mann-Whitney test was used to compare numerical variables between the two groups.

To compare numerical variables between groups, adjusting for age and gender, analysis of covariance (ANCOVA) was used, followed by Tukey-Kramer post-hoc test with variables transformed into ranks due to the absence of a normal distribution. Multiple logistic regression analysis was used to compare categorical variables between two groups.

The significance level adopted was 5% for all tests (P < 0.05).

### Results

**Demographics.** Fifty (50) participants with and 50 without an ulcer participated in the study. In the total study population (N = 100), 58% of participants were male, and median age was 62 years (range 38 to 83 years); differences for age and gender were statistically adjusted because the patients were selected via convenience sampling. Median time since diabetes diagnosis was 15 years (range 3 to 40 years), 85% of participants were using insulin, and median HbA1c level was 8.4% (range 5.9% to 14.5%). No statistically significant differences were noted with respect to these variables between the two groups (P = 0.134).

In the total sample, 82 participants were diagnosed as having hypertension, 62 had dyslipidemia, 23 were obese, 22 had ischemic heart disease, 14 had hypothyroidism, and 15 were smokers.

Demographic and clinical characteristics are summarized in Table 1.

**BDI.** Patients with ulcers had higher BDI scores (mean 20.37; range 1 to 42), indicative of depression, than patients with feet at risk (mean 15.7; range 2 to 49), (P = 0.030). The patients with scores classified as severe were 6.56 times more likely to have an ulcer as patients with scores in the mild category (8% foot at risk and 20% foot with ulcer) (P = 0.049).

The analysis of items that comprise the BDI showed patients with ulcers had higher mean scores for pessimism (foot at risk 0.37, foot with ulcer 0.94; P = 0.018), feelings of punishment (foot at risk 0.48, foot with ulcer 1.20; P = 0.006), self-accusation (foot at risk 0.80, foot with ulcer 1.25; P = 0.002), social isolation (foot at risk 0.32, foot with ulcer 0.85; P = 0.007), loss of appetite (foot at risk 0.71, foot with ulcer 0.69; P = 0.007), and weight loss (foot at risk 0.18, foot with ulcer 0.54; P = 0.046), when compared to patients without ulcers (see Table 2). No significant differences were noted in evaluation of the items sadness, feeling of failure, dissatisfaction, self-depreciation, feelings of guilt, self-punishment, crying, irritability, indecision,

### Table 1. Study participants’ clinical and demographic variables

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Foot at risk</th>
<th>Foot with ulcer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients, n</td>
<td>50</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Age (SD) (years)</td>
<td>64.00 (9.77)</td>
<td>59.50 (8.33)</td>
<td>62.00 (9.15)</td>
</tr>
<tr>
<td>Male (n)</td>
<td>18</td>
<td>41</td>
<td>59</td>
</tr>
<tr>
<td>Time since diagnosis (SD) (years)</td>
<td>17 (9.18)</td>
<td>15 (8.45)</td>
<td>15.00 (8.80)</td>
</tr>
<tr>
<td>HbA1c (SD)</td>
<td>8.65% (2.12)</td>
<td>8.25% (1.89)</td>
<td>8.45% (2.02)</td>
</tr>
<tr>
<td>Insulin requirement (n)</td>
<td>43</td>
<td>42</td>
<td>85</td>
</tr>
<tr>
<td>Primary hypothyroidism (n)</td>
<td>9</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>Arterial hypertension (n)</td>
<td>37</td>
<td>45</td>
<td>82</td>
</tr>
<tr>
<td>Ischemic heart disease (n)</td>
<td>11</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>Dyslipidemia (n)</td>
<td>34</td>
<td>28</td>
<td>62</td>
</tr>
<tr>
<td>Smokers (n)</td>
<td>5</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>
Additionally, gender was identified as a risk factor for ulceration. Several studies indicate a higher prevalence of lower limb complications in male patients. A prospective population-based study involving 279 persons with diabetes and 577 controls identified an association between diabetic neuropathy and male gender. A prospective study with 132 patients with diabetes showed the prevalence of foot lesions was higher in men. In a prospective study conducted among 2,610 patients with type 2 diabetes, researchers documented a higher rate of diabetic neuropathy in male patients. A recent retrospective study among 496 patients also showed that male gender was a significant predictor for ulceration.

Williams et al demonstrated patients with type 2 diabetes and depression present a risk two times higher for having a foot ulcer than persons with diabetes who are not depressed. Winkley et al showed depressive disorder in patients with their first diabetic foot ulcer was associated with a mortality risk two times higher than in patients who were not depressed. Contrary to previously published research, the current study showed a significant difference in depression scores between patients with diabetes and an ulcer when compared to patients with foot at risk.

A systematic review showed some factors seem to be correlated to depression in patients with diabetes: difficulty of acceptance and adaptation to the disease and dealing with the changes imposed on routines of daily life. The functional limitations and other effects of foot problems in persons with diabetes would result in even more lifestyle changes. The occurrence of ulcers in the diabetic foot can have a considerable psychological impact on these patients’ lives. A cross-sectional study involving 14 patients with diabetic foot versus a control group with 24 diabetic patients without any foot problems identified a large impact on physical role, physical functioning, and mobility scores among patients with an ulcer. A qualitative study of 47 patients with a diabetic foot showed the presence of four psychological conditions: living a restricted life, existing in social isolation, experiencing discredited definitions of self, and becoming a burden. In the current study, analysis of the BDI items also provides some understanding about the symptoms associated with depression in these patients.

Depressive symptoms in patients with clinical comorbidity, such as diabetes mellitus, are common. In a recent systematic review of 31 studies, depression was associated with chronic diseases such as diabetes, congestive heart failure, coronary artery disease, osteoarthritis, arthritis rheumatoid, asthma, and chronic obstructive pulmonary disease. At times, somatic symptoms are confused with those of the disease itself, making it useful to differentiate the symptomatic pattern of depression from the characteristics of the disease causing the depression. In this study, somatic complaints such as appetite loss and weight loss were more common in patients with foot ulcers and can be attributed to the underlying disease, medication use, treatment, or complications from diabetes.

<table>
<thead>
<tr>
<th>Foot self care</th>
<th>Participant with foot at risk</th>
<th>Participant with foot ulcer</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (%)</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>1–5 (%)</td>
<td>88%</td>
<td>86%</td>
</tr>
<tr>
<td>≥6 (%)</td>
<td>10%</td>
<td>12%</td>
</tr>
</tbody>
</table>

*0 = excellent, 1–5 = satisfactory, and ≥6 = inadequate*

Discussion

In this study, the overall depression risk score, as well as several individual subscores, were higher among participants with diabetes and an ulcer than among participants with diabetes and a foot at risk for ulceration. The severity of the symptoms of depression increased the chance of presence of ulceration by a factor of six, indicating an association between depression and ulceration, as observed in previous studies.
Some cognitive-affective symptoms noted in the BDI scale were relevant to the group of patients with an ulcer, such as social isolation, punishment feelings, self-accusation, and pessimism. Because ulcers frequently are associated with pain, mobility restrictions, and decreased independence, along with unpleasant appearance and odor that can contribute to refraining from social interaction, social isolation is a risk. In a cross-sectional study of 50 patients with diabetes and foot ulcers, 64% had symptoms of moderate depression—predominantly, sadness, distorted body image, self-deprecation, decreased libido, and social isolation. Cordova and Scott presented a conceptualization of intimacy as a behavioral phenomenon from a theoretical study; they noted that by constantly avoiding social contexts, an individual will have fewer chances to experience positive reinforcement (attention, approval, manifestations of fondness and tenderness), further diminishing his repertoire of social skills.

The current study results suggest some aspects deserve special attention. The feeling of punishment can surface due to the loss of positive reinforcement that occurs when the patient with an ulcer has to abandon activities considered enjoyable at the same time he/she is told to implement activities potentially seen as disagreeable or unpleasant. These situations can be perceived by the patients as damage, loss, or punishment. The feeling of self-accusation also can emerge in this context because in any given moment, the failure to practice foot self-care behavior can trigger a negative consequence such as ulceration and/or amputation.

A cross-sectional study of 316 patients with diabetes yielded the hypothesis that individuals with the disease could be more pessimistic than their counterparts without diabetes mellitus, leading to feelings of hopelessness toward the future, including their own health. This lack of confidence, associated with the difficulty in confronting adverse situations, an individual will have fewer chances to experience positive reinforcement (attention, approval, manifestations of fondness and tenderness), further diminishing his repertoire of social skills.

The current study found patients with severe depression were six times more likely to present with an ulcer as patients with minimal scores of depression in accordance with the findings of Williams et al., who described depression as a risk factor that increased the chance of ulceration.

The rates of ulceration and amputation in patients with diabetic foot suggest the complications frequently occur because of lack of self-care effectiveness and of involvement in high-risk activities. However, this lack of self-care was not noted in the current study, because patients, whether at risk for or who already had a foot ulcer, reported adequate foot self-care.

The high rate of adequate self-care behavior documented in this study may be specific to this study population, because all receive ongoing education about self-care practices. Bell et al. showed patients with diabetes who received education for foot care are more encouraged to practice the necessary self-care behaviors.

Inadequate self-care is frequently associated with the presence of depression. A prospective study evaluated depression symptoms and healthcare in 168 patients with type 2 diabetes and found elevated levels of depression were associated with poor participation in education programs, inadequate diet, and poor medication. A prospective study of 208 patients with type 2 diabetes showed the negative influence of depression over self-care practices such as diet, physical exercise, and foot care. The current study found no evidence of this association; patients with an ulcer, despite evidence of depressive symptoms, performed adequate self-care.

Gonzalez et al. first published that depressive symptoms predicted nonadherence to self-care among patients with type 2 diabetes, but subsequently found the association between depression and ulceration was independent of the occurrence of self-care, underscoring the controversial nature of this issue. On the other hand, such findings strengthen the need for diabetic foot ulcer management within a context that takes into consideration not only physiopathological, but also psychosocial and behavioral aspects.

One of the strong points of the current study is the comparison of depression and self-care between patients at risk for and patients who already had a foot ulcer. Both groups were affected by the lower extremity complications of diabetes, such as alterations in protective sensibility and associated plantar callus and foot deformities such as hammertoes and claw toes.

**Limitations**

The main limitation of this study is the self-reporting of foot care. Because patients were asked about self-care behavior and the responses were not anonymous, it is likely more appropriate foot care behaviors were reported than actually performed, thus underestimating the impact of foot self-care behavior on the risk of ulceration. Additionally, the evaluation of depression was assessed in a single moment, and the study design also did not consider other factors for the development of depression.

**Conclusion**

This study confirmed that depression is common among patients with diabetes mellitus and foot ulcers. Poor self-care behaviors were not reported, even in the presence of depression.

The results of this study reinforce the need for assessing depression among persons with foot ulcers. Future research should examine the cause-and-effect relationship between depression and ulceration as well as interventions related to depression before and after the occurrence of ulceration. In addition, the role of depression treatment in the prevention of foot ulcers and/or foot ulcer complications should be examined.

**References**

3. Ismail K, Winkley K, Stahl D, Chalder T, Edmonds M. A cohort study of