Shoulder pain and dysfunction in 150 type 2 *diabetes mellitus* patients

Dor e disfunção do ombro em 150 pacientes com diabetes melito tipo 2

Patrícia Czelusniak[1], Talissa Gabrielle Ritter Walczak[1], Thelma L. Skare[1]

ABSTRACT

Objective: To study the prevalence of shoulder pain and dysfunction in patients from Southern Brazil with *diabetes mellitus* (DM) and to evaluate the association of pain and dysfunction with diabetes control and epidemiological factors. **Subjects and methods:** We studied 150 patients with type 2 DM for pain and shoulder dysfunction with the UCLA-m (modified University of California at Los Angeles Shoulder Rating Scale); for epidemiological and treatment data, values of Hb A_{1C} and plasma glucose were analyzed. **Results:** Pain was present in 63.4%, and dysfunction in 53.4% of the studied sample; 26.6% of the patients rated shoulder performance as bad. No association was found between Hb A_{1C} or plasma glucose and joint function, except for active flexion of the shoulder and fasting glucose (p = 0.026). Women had worse shoulder performance (p = 0.0043), as did elderly patients (p < 0.0001). **Conclusions:** Shoulder pain and dysfunction is highly prevalent in patients with type 2 diabetes; these disorders affect more women and the elderly. Arq Bras Endocrinol Metab. 2012;56(4):233-7

Keywords
Diabetes mellitus; shoulder; pain; periarthritis

RESUMO

Objetivo: Estudar a prevalência de dor e disfunção do ombro em pacientes com diabetes melito (DM) do sul do Brasil e verificar a possível associação com controle glicêmico e fatores epidemiológicos. **Sujeitos e métodos:** Estudaram-se 150 pacientes com DM tipo 2 para dor e disfunção do ombro pelo instrumento UCLAm (University of California at Los Angeles Shoulder Rating Scale modificada), dados epidemiológicos e de tratamento, valores de Hb A_{1C} e glicemia de jejum. **Resultados:** Verificou-se que havia dor em 63,4% e disfunção em 53,4% da amostra estudada. Em 26,6% dos pacientes, o desempenho do ombro foi considerado ruim. Não se encontrou associação de Hb A_{1C} e glicemia de jejum com dor e disfunção do ombro salvo pela associação entre flexão ativa dessa articulação com glicemia de jejum (p = 0,026). As mulheres tinham pior desempenho do ombro (p = 0,0043), assim como os mais idosos (p < 0,0001). **Conclusões:** Existe uma prevalência muito alta de dor e disfunção do ombro em pacientes com DM tipo 2, sendo maior em mulheres e idosos. Arq Bras Endocrinol Metab. 2012;56(4):233-7

Descritores
Diabetes melito; ombro; dor; periartrite

[1] Serviço de Reumatologia, Hospital Universitário Evangélico de Curitiba, Curitiba, PR, Brazil

INTRODUCTION

Diabetes mellitus (DM) is a clinical entity with a large number of complications (1). Nephropathy, retinopathy, heart disease and stroke are the most studied ones (1), and are also those that receive more attention from the physician seeing these patients. However musculoskeletal complications also contribute to the loss in quality of life of DM patients. There are various forms of recognized musculoskeletal involvement (1,2), and among those in its spectrum are the stiff hand syndrome, various types of tendinitis, Dupuytren's contracture, periarthritis of the shoulder, and adhesive capsulitis (frozen shoulder) (1,2). The occurrence of pain in the shoulder and adhesive

capsulitis in DM are described in greater proportion than in the general population (3).

The shoulder is a complex joint whose performance is crucial for upper limb function and personal autonomy. Its involvement in DM is not well understood. Some authors have reported an association with duration and disease control (as measured by Hb A_{1C} and fasting glucose) (3,4) while others did not observe these findings (5-7). Genetic, environmental, and social factors related to the use of the joint, as well as early diagnosis of diabetes and its control are possible explanations for these discrepancies.

The present study was undertaken to determine the prevalence of shoulder involvement and its association with disease control and duration, in a population of type 2 DM in Southern Brazil.

SUBJECTS AND METHODS

This was an analytical and cross-sectional study. It was approved by the local Committee of Ethics in Research, and all participants signed an informed consent form.

We included 150 consecutive patients with type 2 DM who attended a public health care (Unified Health System or SUS) outpatient clinic for diabetes. Patients underwent an interview and physical examination to fill the UCLA-m (modified University of California at Los Angeles Shoulder Rating Scale) form (8). Information on epidemiological data and on diabetes treatment were also collected, as well as results of fasting glucose and Hb A_{1C}.

The UCLA-m is an instrument composed of the following domains: pain (10 points), function (10 points), range of active flexion (5 points), a test for manual flexion strength (5 points), and patient satisfaction (5 points), with a total of 35 points. The items pain, function (activities of daily living), and patient satisfaction are assessed by questions, and the items range of active flexion and testing for manual flexion strength, by means of physical examination. The score is as follows: 34-35 points, excellent; 28-33, good; 21-27, reasonable; and 0-20, bad (8).

Patients with rheumatological and neurological diseases, history of shoulder trauma, and occupations requiring excessive effort of the anatomical components of the upper limbs were excluded.

Data were collected on frequency and contingency tables. Measurements of central tendency were carried out using the median of nonparametric variables, and

the mean plus standard deviation (SD) for parametric variables. For the study of the association of numeric variables, unpaired t test (parametric variables), and Mann-Whitney test (nonparametric variables) were used, and for correlation studies, Spearman's test was used. The level of significance adopted was 5%. Calculations were made in Graph Pad Prism version 4.0.

RESULTS

From 150 patients, 94 (62.6%) were women and 56 (37.3%) were men. Age ranged between 24 and 87 years (mean 60.5 ± 12.0 years), and disease duration between 1 and 50 years (median 7 years). Hb A_{1C} ranged from 4.4 to 14.3% (median of 7.8%) and fasting blood glucose, between 55 and 375 mg/dL (median 131 mg/dL).

Studying the domains of pain and dysfunction of the UCLA-m in these patients, it was observed that pain affected 63.4%, and dysfunction affected 53.4% of them. The different degrees of pain and dysfunction may be seen in figure 1.

With regards to the range of flexion and active flexion strength of the shoulder, we observed that there was some degree of active flexion dysfunction in 50.6% of patients, and that flexion strength was decreased in 37.2% of them. The different degrees of damage to flexion amplitude and flexion strength amy be seen in figure 2.

Using the total score on the UCLA-m, it was found that 40 (26.2%) patients rated their shoulder function as bad; 26 (17.3%) as reasonable; 35 (23.3%) as good; and 49 (32.6%), as excellent.

Values obtained by the UCLA-m total in relation to sex and age showed that women had a worse results than men (p = 0.0043), and that age was correlated with poorer performance of this joint (p < 0.0001, Spearman's r = -0.354, 95% CI -0.49 to -0.20).

When the UCLA-m score was analyzed in relation to fasting blood glucose and Hb A_{1C} results, we observed that none of these variables was associated with any of the domains or with the total UCLA-m rating (p > 0.05; NS). However, when variations of the UCLA-m were analyzed in relation to drug use, we found that individuals using insulin had a better active flexion than those on diet and oral hypoglycemic agents (p = 0.026), with no differences for the other domains.
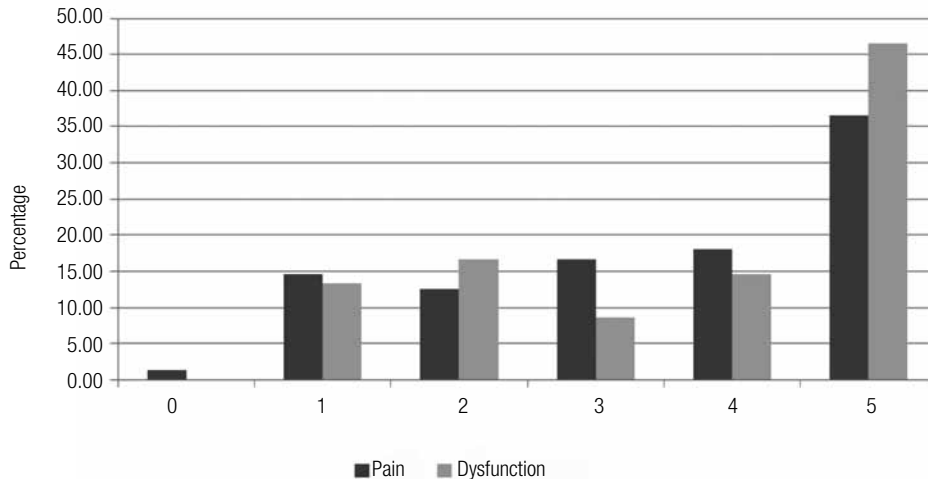
0: severe pain; dysfunction: unable; **1:** pain all the time; dysfunction: do not perform light duties; **2:** pain in perform light duties; dysfunction: patient only carries out light duties; **3:** pain when performing heavy duties; dysfunction: patient is able to perform most tasks; **4:** pain: light possible; dysfunction: difficulty with movements above the shoulder; **5:** no pain and no dysfunction.

Figure 1. Shoulder pain and dysfunction in 150 patients with type 2 *diabetes mellitus*.
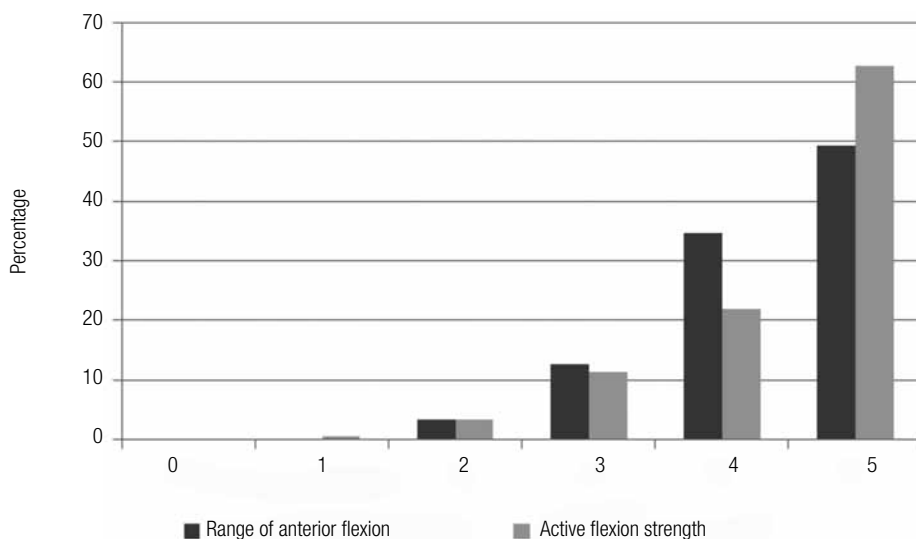
0: degree of anterior flexion < 30; active flexion strength - zero; 1: range of anterior flexion between 30-45°; active flexion strength - grade 1; 2: range of anterior flexion between 45-90°; active flexion strength - grade 2; 3: range of anterior flexion between 90-120°; active flexion strength - grade 3; 4: range of anterior flexion between 120-150°, active flexion strength - grade 4; 5: range of anterior flexion > 150°; active flexion strength - grade 5.

Figure 2. Range of movement and active flexion strength of the shoulder in 150 patients with type 2 *diabetes mellitus*.

DISCUSSION

Shoulder pain is a common musculoskeletal condition with a tendency to become chronic (9). In diabetes, shoulder problems have been described as the most disabling manifestation of musculoskeletal disorders (10). Its mechanism has not been well elucidated. Despite the lack of studies, it is known that persistently high levels of glucose leads to accumulation of advanced glycosylation end-products (AGEs), which form cross-links with collagen (Maillard reaction), making it inelastic and more prone to degenerative processes (11). Human collagen undergoes progressive changes with age that are characterized by changes in color (yellowing), insolubilization and resistance to digestion by proteolytic enzymes (12). These age-related changes are accelerated in diabetes. It is estimated that a patient with diabetes has at least twice the amount of this type of collagen than the non-diabetic population of similar age (11).

In the present study, we found a high rate of pain and functional involvement of the upper shoulder, and performance was rated as poor in 26.6% of the sample. Analysis of any degree of pain showed that it was present in 63% of the patients, and that some kind of dysfunction appeared in 53% of them, values that are greater than those of other studies. Laslett and cols. (5), studying only the painful symptoms, found that 1 out of 3 diabetic patients had complaints related to the shoulder. In contrast, Aydeniz and cols. (13) found a prevalence of 14.7% in 102 diabetic frozen shoulder; Mathew and cols., reported a similar finding in 16.4% (14) of their patients; and Ramchurn and cols. (15), in 25% of their 96 patients. Another study of 291 patients (4) found a prevalence of adhesive capsulitis of the shoulder in 10% of cases of type 1 diabetes, and 22% of cases of type 2 diabetes. However, it is important to note that most of the series above only involved cases of frozen shoulder (adhesive capsulitis), which is the most severe form of this type of joint disorder. Frozen shoulder causes an almost complete loss of mobility, and active or passive glenohumeral joint contracture of the capsule, which adheres to the humeral head, reducing joint volume (16). Another explanation for this discrepancy is that the patients analyzed in our sample were users of the Public Health System. As these patients are generally of lower socioeconomic levels, one can assume that they may have poorer control of their diabetes, which could justify the high prevalence found.

Interestingly, the presence of shoulder pain can also lead to DM diagnosis. In a study of 88 patients initially diagnosed with adhesive capsulitis, 38% were found to be diabetic, and 32.9% were pre-diabetic (10). This data shows the importance of recognizing the association between the two disorders, enabling early DM diagnosis.

Cagliero and cols. (3) found higher levels of Hb A_{1C} in patients with hand or shoulder soft tissue musculoskeletal complaints. Arkkila and cols. (4) found that type 2 diabetes patients with inadequate glycemic control (Hb A_{1C} greater than 9%) had more shoulder capsulitis. However, other clinical studies have not found a significant correlation between Hb A_{1C} and musculoskeletal symptoms in people with *diabetes mellitus* (4-7). In our study, we could not find such association, either. Hb A_{1C} is an intermediate in the formation of AGEs, and its level does not necessarily correlate with the degree of change in extracellular matrix macromolecules. Thus, despite the lack of correlation between Hb A_{1C} levels and upper limb disease, it is likely that poor glycemic control over time influences the development of shoulder problems, although this may not be reflected by a single laboratory test (1). Laslett and cols. (5) found an association between shoulder involvement with diabetic retinopathy. Others associated it with autonomic neuropathy and myocardial infarction (1,16) which are known complications of longstanding diabetes (17,18).

The greater prevalence of shoulder involvement in female and the elderly found in this study has been also identified in the literature. The association between old age and adhesive capsulitis was demonstrated by Arkkila and cols. (4), regardless of the type of diabetes. The preponderance of shoulder complaints in females patients was noted by Cagliero (3) and Laslett and cols. (19).

The lack of association between disease duration and onset of joint involvement may be explained by the fact that it is rather frequent that type 2 DM patients have hyperglicemia several years preceding the diagnosis of diabetes.

Our study has limitations due to its cross-sectional design; it does not allow analysis of prior glycemic control in the occurrence of pain and shoulder dysfunction, which could only be studied in a longitudinal cohort.

In conclusion, we emphasize that there is a high prevalence of shoulder pain and dysfunction in the population with type 2 diabetes from Southern Brazil, greater in women and the elderly. The understanding of the association between DM and this type of joint involvement is important for improving the quality of life of these patients.

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