Skin Changes in Patients with Diabetes Melitus Type 2 and their Impact on Quality of Life

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1. INTRODUCTION

Diabetes mellitus (DM) or "sugar disease" is a chronic metabolic disease characterized by elevated blood sugar levels and disorders in the metabolism of carbohydrates, fats and proteins due to absolute or relative lack of insulin, disorders of insulin action - resistance or a combination of both (1). Changes in the skin or dermatosis can occur as part of diabetic, metabolic disorders or diabetic complications (2). Some authors add a fifth group, endocrine syndromes with skin changes and diabetes, which include migrating necrotic erythema in glucagonoma, skin atrophy, stretch marks and hirsutism in Cushing’s syndrome, thickened skin and increased sweating in acromegaly, ataxia telangiectasia, symptomatic prurigo in endocrine diseases, lipodystrophy in rare endocrine syndromes and diabetes (3). The first group where there are skin changes with a greater or lesser association with diabetes includes: diabetic dermopathy, prurigo, granuloma annulare, dermatitis bullosa diabeticorum, scleredema adultorum, perforative dermatoses. The second group includes infections with bacteria, fungi, viruses and infestations such as scabies. The third group is diabetic complications associated with diabetes mellitus which can be divided into four main groups: a) changes with a greater or lesser association with diabetes mellitus, group 2 patients with infections, group 3 patients with cutaneous manifestations of diabetic complications and group 4 patients with allergic reactions to antidiabetic therapy. Quality of life assessment was performed using the Skindex-29 questionnaire, and the Nijsten categorization was used to assess the impact of skin changes in patients with type 2 diabetes mellitus on quality of life.

Results: There were (51.95%) respondents in group 1, group 2 (24.02%), group 3 (22.22%) and group 4 (1.8%) respondents. In the scale of emotions in 84 respondents (43.0%) the impact on quality of life was serious, in the scale of symptoms in 96 (48%) was moderate, and in the scale of social and physical functioning 106 (55%) also had a moderate impact on quality of life, as well as in the total score of 94 respondents (47%). There was a statistically significant difference in the scale of social and physical functioning in the presence of skin changes in group 1 (x² = 7.95; df = 3, p = 0.045) and group 3 (x² = 12.48, df = 3; p = 0.006), and in the total score of Skindex-29 when it comes to changes in the skin of group 3 (x² = 7.26, df = 3, p = 0.05). Conclusion: the quality of life in patients with type 2 diabetes mellitus which have skin changes is significantly reduced.

Keywords: type 2 diabetes mellitus, skin changes, quality of life, Skindex-29.
with ulcerations, onychodystrophy, alopecia, effluvium and xerosis of the skin. Allergic and non-allergic skin changes in diabetics caused by drug therapy belong to the fourth group.

According to the WHO, quality of life is defined as the perception of an individual’s role in the context of the culture and values in which he or she lives, and in relation to his or her goals, expectations, standards, and preoccupations.

Quality of life itself is widely recognized as a very important component of health status in people with diabetes mellitus, where patients carry a huge burden of a very demanding regime and disease management (4). Initially, studies on diabetes focused on studying the quality of life in people with diabetes mellitus with serious complications of the disease itself, such as patients on haemodialysis, who had a kidney transplant or had their foot or leg amputated. Subsequent studies have focused more on the psychological impact of the disease itself on quality of life, which striving to understand the patient’s ability to cope with a complicated and demanding treatment regimen. Studies have shown that diabetes has an extremely negative impact on quality of life, especially diabetes with complications (5). Diabetic polyneuropathy negatively affects quality of life. The quality of life of patients with polyneuropathy of mostly mixed pathogenesis and sensorimotor type becomes poorer for these reasons even when patients do not have clinically manifested polyneuropathy, but it has been verified by electromyoneurography (6). A strong association of ulcerations on the foot over 5 cm in diameter has been proven as a common long-term complication of diabetes and quality of life especially the physical component (7). Most of these studies on the association between quality of life and diabetes mellitus have been conducted in developed countries, and only rarely in developing countries (8). The outcome of the reaction to the disease depends on many factors: the personality of the individual, the type and severity of the disease, the external circumstances in which he lives, the family’s reaction to the patient and his illness. Not surprisingly, the emotional response to diabetes often complicates treatment. On the one hand, the first reaction may be non-acceptance of the disease and refusal to cooperate. The other extreme is excessive preoccupation with the disease. The physician should make an effort to determine a middle ground so that the patient accepts his illness and reacts reasonable, without the disease becoming an obsession for him. The goal is to live with diabetes, not for it (9).

A person who achieves a successful emotional adjustment will sooner or later reach the point of accepting his illness. Of course, the life of every person with diabetes is unique. Most patients manage the disease actively and effectively, but almost every person with diabetes mellitus feels strongly its impact on life and carries a huge burden of this very demanding disease (10).

2. AIM
To examine the impact of skin changes in patients with type 2 diabetes mellitus on quality of life.

3. MATERIAL AND METHODS
The prospective study included 200 patients with type 2 diabetes mellitus with skin changes associated with diabetes, both genders, aged 20–60 years, treated at the Department of Skin and Venerreal Diseases of the Cantonal Hospital “Dr. Irfan Ljubijankić” in Bihać. Subjects were divided into four groups according to the type of skin changes associated with diabetes mellitus. Group 1 consisted of patients with skin changes with a greater or lesser association with diabetes mellitus, group 2 patients with infections, group 3 patients with cutaneous manifestations of diabetic complications and group 4 patients with allergic reactions to anti-diabetic therapy.

Quality of life assessment was performed using the Skindex-29 questionnaire, a questionnaire for measuring the quality of life in patients with skin diseases consisting of 30 questions classified into three scales (emotion scale, symptom scale and social and physical functioning scale). The emotion scale has 10 questions, the symptom scale has 7 questions, and the functioning scale has 12 questions. Patients will answer the questions with: never, rarely, sometimes, often and constantly. The answer Never will be scored with 0, Rarely with 25, Sometimes with 50, Often with 75, and Constantly with 100 points. All answers will be transferred to a linear scale of 100, ranging from 0 (no impact) to 100 (experienced impact all the time). Therefore, each statement can have a minimum score of 0 and a maximum score of 100. The score of the scale will be calculated as the mean value of the patient’s answers to the questions in the given scale. The cumulative score will be calculated as the average value of the scores of all three scales (11). The Nijsten categorization was used to assess the impact of skin changes in patients with type 2 diabetes mellitus on quality of life (12).

All respondents were introduced with the goals and nature of the research, the method of research and their permission and consent to participate in the research was sought. The research was approved by the Commission for Ethical Issues of the Cantonal Hospital “Dr Irfan Ljubijankić” in Bihać.

| Categorization | Symptom scale | Emotion scale | Scale of social and physical functioning | Cumulative score |
|----------------|---------------|---------------|------------------------------------------|------------------|
| Very small     | <3            | <5            | <3                                      | <5               |
| Mild           | 4-10          | 6-24          | 4-10                                    | 6-17             |
| Moderate       | 11-25         | 25-49         | 11-32                                   | 18-36            |
| Serious        | 26-49         | >50           | >53                                     | >37              |
| Very serious   | >50           | -             | -                                       | -                |

Table 1. Categorization of the impact of diabetes-related skin changes on quality of life according to Nijsten

Statistical analysis
Statistical analysis was performed in the software package SPSS 22.0 (Armonk, NY: IBM Corp). Descriptive statistics parameters were used to display the basic characteristics of the sample. Student’s t-test was used to compare quantitative variables where possible, otherwise the Mann-Whitney test was used. The chi-square or Fisher test was used to compare categorical variables. For comparisons of multiple variables, either ANOVA or its nonparametric alternative Friedman test was used. The statistical correlation between the variables was tested using Spearman’s
correlation test. The level of statistical significance of 95% (p <0.05) was considered as the limit of significance for all statistical tests.

4. RESULTS

In the overall sample, a prospective study examined 200 subjects with type 2 diabetes mellitus which had skin changes associated with diabetes. There was a total of 122 (61%) female and 78 (39%) male respondents in the sample, with a M: F ratio of 1.56: 1. Subjects were divided into four groups according to the type of skin changes. There were (51.95%) respondents in group 1, group 2 (24.02%), group 3 (22.22%) and group 4 (1.8%) respondents.

The values of the skinindex-29 score and its sub-scores were compared, with regard to the presence of skin changes in each group. When comparing the scores with regard to the presence of skin changes belonging to group 1, a significant difference was found when it came to the scale of social and physical functioning 26.86 ± 16.93, p = 0.01, and in the scale of emotions 31.05 ± 17.18; p = 0.87, symptom scale 36.22 ± 19.80; p = 0.15 and overall skinindex-29 31.45 ± 15.32, p = 0.10 the difference was not statistically significant. In the presence of changes belonging to group 2, there was no difference in the scales nor in the complete value of the Skinindex score. In the emotion scale 30.97 ± 17.61; p = 0.88, symptom scale 37.82 ± 19.46; p = 0.05, scale of social and physical functioning 27.75 ± 17.44; p = 0.37 and total skinindex-29 score 32.15 ± 15.96; p = 0.66. However, in the cases of changes belonging to group 3, again a significant difference was found when it came to the scale of social and physical functioning 35.94 ± 18.88; p <0.001, and in the emotion scale 31.49 ± 15.73; p = 0.86, symptom scale 38.76 ± 19.28; p = 0.62 and total skinindex-29 score 35.36 ± 15.32; p = 0.09 there was no significant difference. When it came to changes that belonged to group 4, no differences were found in the values of the scales and the total Skinindex score. In the emotion scale 23.75 ± 12.22; p = 0.27, symptom scale 47.37 ± 16.04; p = 0.23, social and physical functioning scale 29.81 ± 18.75; p = 0.94 and total Skinindex score 34.29 ± 14.95; p = 0.81.

In addition, the frequency of individual categories of the level of the influence of skin changes according to Nijsten was analysed, considering the presence of skin changes in a certain group. Only Tables 2, 3, 4 are shown in which a statistically significant difference was detected. Thus, significant differences in the frequency of different categories of skin-changes-level-impact were detected in the scale of social and physical functioning where skin changes of type 1 and 3 were present, and in the overall Skinindex when it came to skin changes of type 3.

Quality of life is also compared between the genders. As it can be observed, there were no differences in the average values of the scores between male and female subjects. On the emotion scale for M 30.91 ± 17.62; F 31.59 ± 16.52 (p = 0.85), symptom scale M 38.45 ± 20.96; F 37.34 ± 18.99 (p = 0.57), scale of social and physical functioning M 31.67 ± 20.59; F 27.64 ± 16.24, (p = 0.13) and total skinindex-29 score M 35.72 ± 17.45; F 32.16 ± 14.17, (p = 0.49).

5. DISCUSSION

Type 2 diabetes mellitus is a chronic disease that affects the perception of general health and the feeling of well-being in several ways. For example, numerous dietary restrictions, i.e., diabetic diet, then daily self-monitoring and management of disease treatment, as well as oral therapy or the use of insulin can adversely affect the quality of life of patients. In addition, time spent with diabetes and the occurrence of complications of diseases such as nephropathy, neuropathy, heart disease and stroke disrupt health status and negatively affect quality of life (15). Patients with type 2 diabetes mellitus have a poorer quality of life than people without chronic diseases but a better quality of life than those with a large number of other more serious chronic diseases. The dura-

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**Table 2.** The frequency of individual categories of the level of the influence of skin changes according to Nijsten, considering the presence of skin changes from group 1 in the scale of social and physical functioning. X2=7,95; df=3; p=0,045.

| Skin changes of group 1 | No | %  | Yes | %  | Total | %  |
|-------------------------|----|----|-----|----|-------|----|
| Scale of social and physical functioning | Very small | 3 | 31 | 33 | 70 | 27.3% | 21.4% | 29.2% | 47.8% | 35.0% |
| | Mild | 11 | 75 | 36 | 130 | 72.7% | 78.6% | 70.8% | 52.2% | 65.0% |
| | Moderate | 8 | 110 | 69 | 200 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

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**Table 3.** The frequency of individual categories of the level of the influence of skin changes according to Nijsten, considering the presence of skin changes from group 3 in the scale of social and physical functioning. X2=12.48; df=3; p=0.006.

| Skin changes of group 3 | No | %  | Yes | %  | Total | %  |
|-------------------------|----|----|-----|----|-------|----|
| Scale of social and physical functioning | Very small | 10 | 12 | 75 | 133 | 90.9% | 85.7% | 70.8% | 52.2% | 66.5% |
| | Mild | 1 | 2 | 31 | 33 | 67 | 9.1% | 14.3% | 29.2% | 47.8% | 33.5% |
| | Moderate | 11 | 14 | 106 | 69 | 200 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

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**Table 4.** The frequency of individual categories of the level of the influence of skin changes according to Nijsten, considering the presence of skin changes from group 3 for the overall score Skinindex-29. X2=7,26; df=3; p=0,05

| Skin changes of group 3 | No | %  | Yes | %  | Total | %  |
|-------------------------|----|----|-----|----|-------|----|
| Scale of social and physical functioning | Very small | 1 | 26 | 94 | 178 | 50.0% | 34.6% | 24.5% | 43.6% | 33.5% |
| | Mild | 1 | 71 | 44 | 133 | 50.0% | 65.4% | 75.5% | 56.4% | 66.5% |
| | Moderate | 2 | 34 | 23 | 67 | 50.0% | 34.6% | 24.5% | 43.6% | 33.5% |
| | Serious | 2 | 78 | 44 | 120 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

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