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Effects of Initial Periodontal Treatment in Moderately Compensated and Decompensated Type 2 Diabetic Patients

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Authors' contributions

This work was carried out in collaboration between all authors. Authors PB, CAGJ, MMMZ, MCA and JCMM did the experimental studies, data and statistical analysis, manuscript preparation, editing and review. Authors GT, KFDC and BMS did the experimental studies, data analysis and manuscript preparation. Authors CAN and PON definition of intellectual content, design, experimental studies, data and statistical analysis, manuscript preparation, editing and review. All authors read and approved the final manuscript.

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ABSTRACT

Objective: The objectives of this research were to evaluate the effect of periodontal therapy in moderately compensated and decompensated type 2 diabetic patients.
Materials and Methods: 20 patients with type 2 diabetes mellitus (DM2) and periodontal disease were selected and divided into two groups (based on HbA1c level): Group 1: Moderately compensated; Group 2: Decompensated. The analyses including clinical periodontal parameters and the quantification of gingival crevicular fluid (GCF), the IL1-β expression in the GCF and Glycated hemoglobin (HbA1c) and fasting glucose (FG) from venous blood were performed at 0, 3, and 6 months.
Results: Both groups presented improvement in all clinical periodontal parameters as well as quantification of gingival crevicular fluid and in the expression of IL-1ß present in the fluid after 6 months. However, no statistically significant difference was found in the levels of HbA1C in the group 1 after 6 months, although a significant increase was found after six months in the group 2. While in relation to the FG, a great improvement was found in the group 1 and a significant increase in the group 2 after six months.
Conclusions: It was possible to observe that conventional periodontal treatment (scaling and root planning) is more effective for moderately compensated type 2 diabetic patients' glycemic control rather than for the decompensated patients.

Keywords: Diabetes mellitus; gingival crevicular fluid; periodontal disease; glycemic control.

1. INTRODUCTION

Diabetes Mellitus (DM) is not a single disease, but a heterogeneous group of metabolic disorders that have in common the hyperglycemia, which is the result of defects in insulin action or secretion, or in both [1].

The periodontal disease (PD) is a chronic inflammatory disease of infectious cause, characterized by destruction of supporting structures of the teeth, including from tissue attachment to the alveolar bone [2].

According to Engebretson et al. [3] patients with type 2 diabetes have greater incidence and severity of periodontal disease than those without diabetes. PD is the sixth complication of DM and its prevalence in these patients as compared to non-diabetics has been found to be 59.6% in diabetics vs. 39.0% in non-diabetics [4]. The majority of well-controlled studies show a higher prevalence and severity of periodontal disease in diabetics than in non-diabetics with similar local irritation including greater loss of attachment, greater alveolar bone loss, increased bleeding on probing, and increased tooth mobility resulting in tooth loss [5].

Substantial evidence has been demonstrating DM as a risk for the impairment of periodontal health and a growing body of evidence has been supporting PD as having an adverse effect on glycemic control and on the pathophysiology of diabetes-related complications [6]. This way, inflamed periodontal tissue may serve as a chronic source of bacteria, bacterial products and many inflammatory mediators such as Tumor Necrosis Factor-alpha (TNF-α), Interleukin-6 (IL-6) and Interleukin-1 (IL-1), which have important effects on lipid and glucose metabolism, also been reported to be insulin antagonists and causing its resistance [7,8]. This bi-directional relationship has important implications for patients with diabetes, considering the significant morbidity and mortality associated with the disease [9].

According to Rajkumar et al. [5], most striking changes in uncontrolled diabetes are reduction in defense mechanism and increased susceptibility to infection leading to destructive periodontal disease. According to the opinion of many clinicians periodontal disease in diabetics follows no consistent pattern. Very severe gingival inflammation, deep periodontal pockets, rapid bone loss, and frequent periodontal abscess often occur in diabetic patients with poor oral hygiene. Once the DM affect the defense mechanisms involving micro and macro circulation, there is an increase in susceptibility to infection and reduced healing capacity by the change in collagen metabolism, increasing the level of periodontal destruction.

The World Health Organization [10] defines as chronic diseases: cardiovascular diseases (stroke, ischemic), neoplasms, chronic respiratory diseases and diabetes mellitus. The WHO also includes those diseases that contribute to the suffering of individuals, families and society, such as the mental disorders and neurological diseases, oral health, bone and joint, the genetic disorders and the ocular and hearing pathologies in this list [10].

Thus, both periodontal disease and diabetes are considered non-communicable chronic diseases (NCDs). Considered as epidemic nowadays, the NCD constitute a serious public health problem, both in rich countries as well as in middle and low income ones [11]. Nevertheless, it is true that the poor countries suffer more complications as smaller are their possibilities to ensure public policies that adversely affect positively the social determinants of health [11]. Thus, the production of knowledge about each of these two clinical conditions and their risk factors, as well as the relationship between them, helps to create necessary tools for public health, for more effective treatment and its proper control.

Considering the above, this research aims to evaluate the effect of periodontal treatment in patients with moderately compensated and decompensated type 2 DM.

2. MATERIALS AND METHODS

Among the patients treated in the Outpatient Dentistry Clinic from UNIOESTE in the period from August 2013 to September 2014, 30 were selected voluntarily, but only 20 patients of both genders, aged 25-75 years, with type 2 diabetes and chronic periodontitis were selected for this study [12]. The sample of diabetic patients was selected in the Periodontics clinic and the inclusion and exclusion criteria were strictly obeyed for this selection; the division into groups was random for the periodontal treatments, being 10 patients with moderately compensated type 2 DM and 10 patients with decompensated type 2 DM.

As inclusion criteria for both groups, patients could be of both genders and should present chronic periodontitis moderate-to-severe, localized or generalized, with at least 4 sites with probing depth greater than 5mm and level of clinical insertion greater or equal to 4 mm, not in the same position, with bleeding on probing and gingival inflammation, free of tooth decay and/or prostheses on clinical examination. In group I patients should have moderately compensated type 2 DM (HbA1c < 8%). In group II patients should have poorly compensated type 2 DM (HbA1c > 8%). The teeth, for all groups, should be present in a normal position, with a minimum number of 20 teeth in the arch, after clinical examination performed on the buccal, lingual/palatal, mesial and distal faces.

As exclusion criteria, patients should present positive history in the last six months of therapy with broad-spectrum antibiotics, steroidal anti-inflammatory drugs or anticoagulants and immunosuppressant therapy three months preceding study, positive history of pregnancy or breastfeeding, positive history of any type of serious systemic problems or positive history of periodontal treatment in the last 6 months.

2.1 Clinical Evaluation

A single examiner previously trained performed the initial clinical examination, in which through a no. 23 periodontal probe Type WILLIAMS in. 23 determined:

1. Plaque Index of Silness & Löe [13].
2. Gingival Index of Löe & Silness [14].
3. Probing Depth: for each tooth that was examined was measured the distance from the bottom of gingival sulcus to the gingival margin in six points: mesio-buccal, distal buccal, lingual/palatal and lingual/palatal and buccal-lingual/palatal.
4. Clinical attachment level: distance between the cemento-enamel junction (CEJ) and the bottom of the pocket or sulcus, also determined at the same points of probing depth.
5. Bleeding on probing: presence or absence of bleeding, within a time of 30 seconds after measured the probing depth.

2.2 Laboratory Evaluation

Blood examination of the following parameters was solicited to each patient of the project in the initial period, after 3 months and then 6 months after the experiment:

1. Glycated hemoglobin (HbA1c).
2. Fasting glycemia test.

After the clinical examination and initial laboratory assessment, patients were divided into 2 groups, with 10 patients each, in accordance with chart 1.

2.3 Gingival Crevicular Fluid Analysis (GCF)

Collections were made in 4 sites with probing depth greater than 5 mm, on the buccal and lingual/palatal faces with absorbent paper points. With the area dried and the biofilm removed, they were inserted below the gingival margin by 30 seconds. The paper points were placed immediately in 0,2% alcoholic ninhydrin solution. Then, they were photographed and analyzed with a computer program (Image Pro Plus® Version 4.5.0.29, Media Cybernetics, Silver Spring, MD, USA) for determining the amount of fluid absorbed in mm2 [15].

2.4 Expression of IL-1β Isoforms Analysis

Four sites with probing depth greater than or equal to 5 mm and bleeding on probing (deep sites) and 4 with probing depth less than or equal to 3 mm and bleeding on probing (shallow sites), in different teeth, non-adjacentwere selected for both groups. Initially, supragingival plaque was removed from the selected sites and then the region was isolated with rolls of sterile cotton and gently dried with compressed air. The stagnant sulcular fluid was collected with the introduction of a sterile absorbent paper point maintained for 30 seconds on the selected sites and the samples contaminated with blood were discarded. The points containing the fluid of sites with the same characteristics of each patient were wrapped in a single eppendorf tube containing 1 ml of phosphate-buffered saline (PBS). After collection, the paper points remained in Eppendorf tubes for 40 minutes at ambient temperature for subsequent removal of and centrifugation of Eppendorfs (10000 turns for 10 minutes at a temperature of 4°C). The supernatant was collected and packed in a new sterile Eppendorf and frozen in a freezer at -80°C. These samples were used to assess the quantity of IL1-Î through analysis by Linked Immunosorbent Assay Coupled to Enzymes (ELISA).

The patients were evaluated for a total period of 6 months, and the clinical evaluation, laboratory testing and analysis of gingival crevicular fluid were performed in periods of 0, 3 and 6 months, and in all periods the patients were again instructed and received maintenance therapy. The expression of IL-1β analysis was performed at the beginning and after 6 months. The brushes used for the mechanical procedure were standardized through features such as soft and horizontal bristles from same sizes and head of small size, regardless of the brand, as well as the toothpaste could not present any component that could alter the accumulation of plaque, in addition to the basic components of a fluoridated toothpaste.

2.5 Data Analysis

The obtained data were analyzed and evaluated using the one way ANOVA test, and when statistically significant differences were found, the Tukey test was performed to determine differences between groups, at 5% significance level.

2.6 Ethical Aspects

This research was approved by the Research Ethics Committee of the State University of West Parana, with Opinion Nº 461,188. The Free and Informed Consent was signed by the responsible.

3. RESULTS

3.1 Personal Data

Regarding personal data, of the 20 patients, 55% were more than 45 years old, while 45% were 45 years old or less. Of these, 75% were female and 25% were male. 14,3% of these were smokers, 14,3% were ex-smokers and 71,4% were nonsmokers.

3.2 Data of Diabetes

In relation to diabetes, the analyzed data showed: 57,1% were treated only with oral antidiabetic drugs, 7,1% were treated only with insulin, 7,1% with oral antidiabetic drugs and insulin, and 28,7% were just on a diet. 60% of these patients had no change in the treatment regimen during the study period, 40% had (the majority had an increased dose). Only 1 patient started to control only based on an hypoglycemic diet and 1 due to allergy.

It was also possible to observe that 23,8% are within the ideal weight, 33,3% are overweight, 19,0% are with grade I obesity, 14,3% are grade II obesity and 9,6% with grade III obesity according to the criterion of Cole et al. (2000).

Besides it, only 15% of the patients had already received prior information on the importance of oral health in the control of the disease, and 5%

received information by the physician of the basic health unity, 5% by the dentist and 5% could not say.

3.3 Laboratorials and Clinicals Evaluations

Table 1 shows the mean Plaque Index and Gingival Index of 3 periods in all groups treated in accordance with chart 1. The results of the clinical evaluation showed that both the plaque index and gingival index had a significant decrease at the end of 6 months for both groups. Regarding to plaque index, there was a reduction of 75,8% in group 1 and 60,9% in group 2. About the gingival index, there was a reduction of 69,3% in group 1 and 69,5% in group 2.

Table 2 shows the mean Probing Depth and the Level of Insertion of the 3 periods in all groups treated in accordance with chart 1. The results of the clinical evaluation showed that both in probing depth and the level of insertion, there was a significant decrease at the end of 6 months. Regarding to the probing depth, there was a reduction of 36,8% in group 1 and 17,4% in group 2. In relation to Level of Insertion there was a reduction of 40% in group 1 and 20,7% in group 2.

Table 3 shows the averages of the Bleeding on Probing of 3 periods conducted in all groups treated in accordance with chart 1. The results showed that there was a significant decrease of this parameter in both groups after the period of 6 months (83,3% in group 1 and 84,5% in group 2).

Table 4 shows the mean values of Glycated Hemoglobin and Fasting Glucose levels in 3 periods performed in both groups treated in accordance with chart 1. The results of the laboratory evaluation showed that in relation to the values of the Glycated Hemoglobin, statistically, there was no change at the end of 6 months in group 1, while in group 2, there was a significant increase of 13% at the end of 6 months. Regarding to the Fasting Glucose, there was a significant improvement of 41,7% in group 1 and a significant increase of 19,9% in group 2 at the end of 6 months.

Table 1. Distribution of the 20 patients in accordance to the proposed treatments

Groups	Initial	3 months	6 months
Group 1: Moderately Compensated Type 2 Diabetes Mellitus	Instruction and motivation of oral hygiene Supragingival and subgingival scaling. Root planing and coronary polishing Immunological analysis	Support Periodontal Therapy Immunological analysis	Support Periodontal Therapy Immunological analysis
Group 2: Decompensated Type 2 Diabetes Mellitus	Instruction and motivation of oral hygiene Supragingival and subgingival scaling. Root planing and coronary polishing Immunological analysis	Support Periodontal Therapy Immunological analysis	Support Periodontal Therapy Immunological analysis

Table 2. Values of plaque index and gingival index in both groups during periods of 0, 3 and 6 months. The values represent mean ± standard deviation. The results are expressed in percentages

	Plaque	Index	Gingival	Index
	Group 1	Group 2	Group 1	Group 2
1º exam (0)	54.2±12.1 ^{A}	74.4±2.4 ^{A}	15.0±3.6 ^{A}	16.4±1.0 ^{A}
2º exam (3 months)	44.8±12.5 ^{B}	50.7±4.1 ^{B}	9.0±3.1 ^{AB}	10.2±1.3 ^{B}
3º exam (6 months)	13.1±3.3 ^{C}	29.1±2.5 ^{C}	4.6±2.0 ^{B}	5.0±0.4 ^{C}
Δ (0-180 days)	0.5±0.3	0.7±0.1	0.7±0.3	1.0±0.8

Different letters, (p<0.05) data statistically different within the same group

Table 3. Values of probing depth and level of Insertion in both groups during periods of 0, 3 and 6 months. The values represent mean ± standard deviation. The results are expressed in millimeters

	Probing Depth		Clinical Attachment level	
	Group 1	Group 2	Group 1	Group 2
1º exam (0)	1.9±0.2 ^{A}	2.3±0.04 ^{A}	2.0±0.3 ^{A}	2.9±0.1 ^{A}
2º exam (3 months)	1.7±0.1 ^{AB}	2.1±0.1 ^{B}	1.8±0.2 ^{B}	2.4±0.1 ^{B}
3º exam (6 months)	1.2±0.01 ^{B}	1.9±0.6 ^{B}	1.2±0.06 ^{C}	2.3±0.05 ^{B}
Δ (0-180 days)	0.7±0.1	0.4±0.07 $^{@}$	0.8±0.08	0.6±0.06$^{@}$

Different letters, (p< 0.05) data statistically different within the same group
$^{@}$ *(p<0.05) statistically different data among the groups*

Table 4. Values of Bleeding on Probing in both groups during periods of 0, 3 and 6 months. The values represent mean ± standard deviation. The results are expressed in percentage

	Bleeding On probing	
	Group 1	Group 2
1º exam (0)	3.0±1.3	20.7±3.8 ^{A}
2º exam (3 months)	1.9±1.0	8.2±1.9 ^{B}
3º exam (6 months)	0.5±0.4	3.2±0.9 ^{B}
Δ (0-180 days)	2.5±1.0	17.5±8.5 $^{@}$

Different letters,(p<0,05) data statistically different within the same group
$^{@}$ *(p<0.05) statistically different data among the groups*

Table 5 shows the mean amount of Gingival Crevicular Fluid (GFC) measured by area of 3 periods conducted in all groups treated in accordance with chart 1. The results showed that there was a significant decrease in both groups after the period of 6 months (32,1% in group 1 and 27,5% in group 2).

Table 6 shows the average values of the expression of IL1- ß at the beginning and after 180 days in both groups treated in accordance with chart 1. It was possible to observe a significant reduction of the expression of IL1- ß in both groups (92,9% in group 1 and 73,6% in group 2).

Table 5. Values of glycated hemoglobin and fasting glucose in both groups during periods of 0, 3 and 6 months. The values represent mean ± standard deviation. The results are expressed as mean percent values for HbA1c and in mg/dL to fasting glycemia

	Glycated Hemoglobin		Fasting Glucose	
	Group 1	Group 2	Group 1	Group 2
1º exam (0)	6.6±1.3 ^{A}	10.8±1.7 ^{A}	186.5±14.0 ^{A}	230.4±7.3 ^{A}
2º exam (3 months)	7.2±1.6 ^{A}	10.8±3.5 ^{A}	123.3±16.1 ^{B}	246.2±9.7 ^{A}
3º exam (6 months)	6.7±0.7 ^{A}	12.2±2.1 ^{B}	108.8±15.8 ^{B}	276.2±3.8 ^{B}
Δ (0-180 days)	0.4±0.07	1.8±0.9	55.1±7.5	19.7±2.5 $^{@}$

Different letters, (p<0,05) data statistically different within the same group
$^{@}$ *(p<0.05) statistically different data among the groups*

Table 6. Values of the area of gingival crevicular fluid. The values represent mean ± standard deviation. The results are expressed in square pixels

	Group 1	Group 2
1º exam (0)	6086.8±351.4 ^{A}	5681.6±144.4 ^{A}
2º exam (3 months)	4648.4±281.3 ^{B}	4513.4±157.0 ^{B}
3º exam (6 months)	4133.5±314.1^{B}	4119.4±107.9 ^{C}
Δ (0-180 days)	2870.8±252.5	1999.3±90.5$^{@}$

Different letters (p<0,05) data statistically different within the same group
$^{@}$ *(p<0.05) statistically different data among the groups*

Table 7. Values of the expression of IL1-β in both groups in the period of 0, 3 and 6 months. The values represent mean ± standard deviation. The results are expressed as mean values in µg/mL

	Group 1	Group 2
1º exam (0)	14.1±3.5 ^{A}	21.2±7.5 ^{A}
2º exam (3 months)	6.4±3.9 ^{B}	8.2±5.9 ^{B}
3º exam (6 months)	1.0±0.8 ^{C}	5.6±5.0 ^{B}
Δ (0-180 days)	14.1±3.5	15.7±5.5

Different letters, (p<0,05) data statistically different within the same group

4. DISCUSSION

Periodontitis is the most common chronic oral infection and has the highest rate of tooth loss in adults, besides being considered the sixth complication of diabetes [4]. It has showed to be a risk factor for poor glycemic control in patients with diabetes due to bacteria and their by-products in the inflamed periodontal tissue, constituting a chronic source of systemic challenges to the host [16]. This way, it is important to understand the possible relationship between the treatment of periodontitis and the metabolic control of diabetes mellitus, once the treatment of periodontitis in these patients may lead to reduction in soluble mediators responsible for the destruction of periodontal tissues and reduce insulin resistance in tissues [7].

The results of this study have showed that all clinical parameters studied, among them plaque index, gingival index, probing depth, bleeding on probing and level of clinical insertion showed a significant improvement at the end of 6 months of study in both groups. These results are in agreement with the studies of Faria-Almeida et al. [7] whom conducted a prospective study, parallel and longitudinal comparison between type 2 diabetic patients and non-diabetic patients with generalized moderate chronic periodontitis. The parameters studied were plaque index, probing depth, bleeding on probing and level of clinical insertion. All variables behaved similarly in both groups, and all variables showed improvements between the beginning and 3 months and between 3 and 6 months after conventional treatment by means of instruction, oral hygiene, prophylaxis and scaling and root planing with Gracey curettes for 4 sessions. However, in a study conducted by Kardesler et al. [17], the results showed that there were no significant differences between the group DM and the PD parameters in clinical periodontal.

The results of the laboratory evaluation of this study showed that in relation to the values of the (HbA1c), statistically, there was no change at the end of 6 months in group 1, while in group 2, there was a significant increase of 13% at the end of 6 months. As for the fasting glucose, there was a significant improvement in group 1 and a significant increase in group 2 at the end of 6 months. Corroborating with these results, in 2012, Yoon et al. [9] studied the relationship between type 2 diabetes and periodontal disease with oral inflammatory load evaluated by inflammatory markers of saliva. As a result, for the patients with diabetes there were no statistically significant differences in the mean levels of serum glucose, when stratified by severity of periodontal disease, but there was a trend to lower levels for edentulous patients when compared with patients with periodontal disease mild to moderate and severe.

On the other hand, Miller et al. [18] studied the effect of periodontal therapy in diabetic patients and observed that there was a reduction of HbA1c in patients who underwent periodontal therapy with systemic doxycycline systemic and oral rinses. The removal of pathogens by treatment leads to a reduction in inflammation, which in turn reduces insulin resistance, and thus, reduces the level of sugar. The absence of inflammation causes a decrease in the level of adrenaline, which regulates the action anti-insulin, leading to a decrease in the level of sugar. These facts together lead to a general reduction in the dose of insulin or oral hypoglycemic agents.

The results obtained in this study showed that the average values of the expression of IL1-ß at the beginning and after 6 months in both groups treated with prophylaxis, scaling and root planing and instruction of oral hygiene every 3 months showed a significant reduction in the expression of IL1-ß in group 1 and significant only in the beginning until 3 months in group 2. About the volume of GCF measured by area of the 3 periods performed, both in group moderately compensated and decompensated group, there was a significant decrease after the period of 6 months. In comparison to this, in a study conducted by Engebretson et al. [3], the levels of IL1-ß in GCF showed a significantly positive correlation with probing depth, average clinical insertion loss, percentage of sites with bleeding

on probing and glucose in the blood, but without percentage of sites displaying dental plaque. A total quantity of IL-1ß from the GCF was significantly higher in those patients with HbA1c greater than 8%. A study carried out by Correa et al. [19] showed that non-surgical periodontal treatment significantly reduced the levels of IL1-ß, matrix metalloproteins- 8 and -9 (MMP-8 and -9) and the activity of elastase in GCF of individuals with type 2 DM.

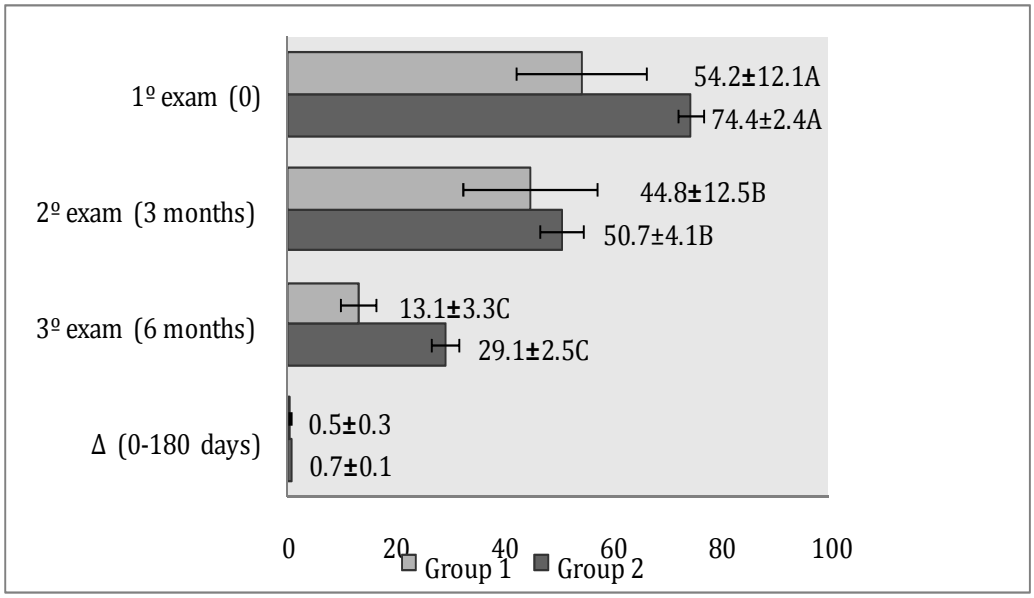

Fig. 1. Values of plaque index in both groups during periods of 0, 3 and 6 months. The results are expressed in percentage. Different letters, (p<0.05) data statistically different within the same group

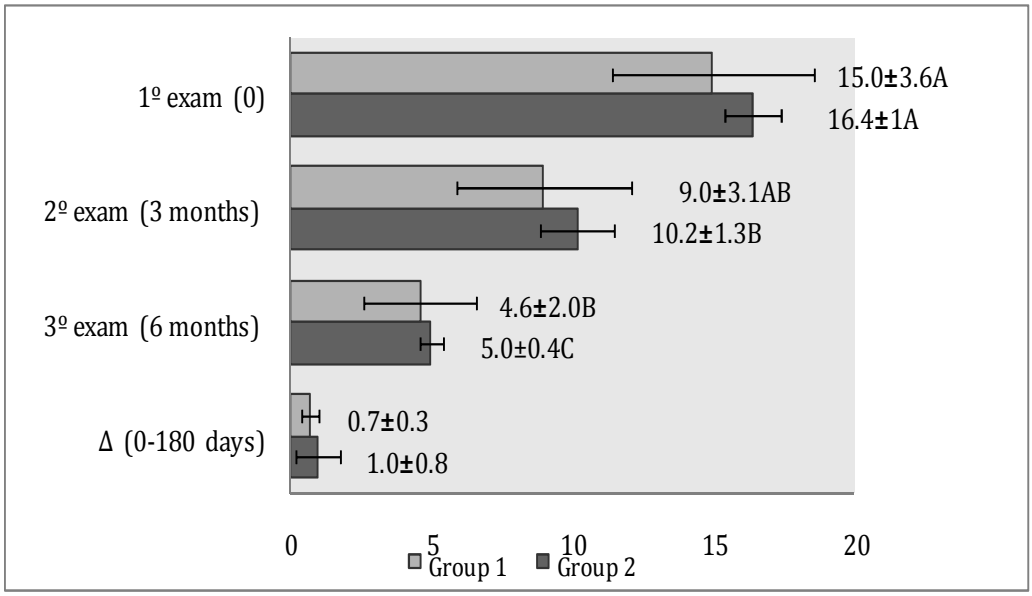

Fig. 2. Values of gingival index in both groups during periods of 0, 3 and 6 months. The results are expressed in percentage. Different letters, (p<0.05) data statistically different within the same group

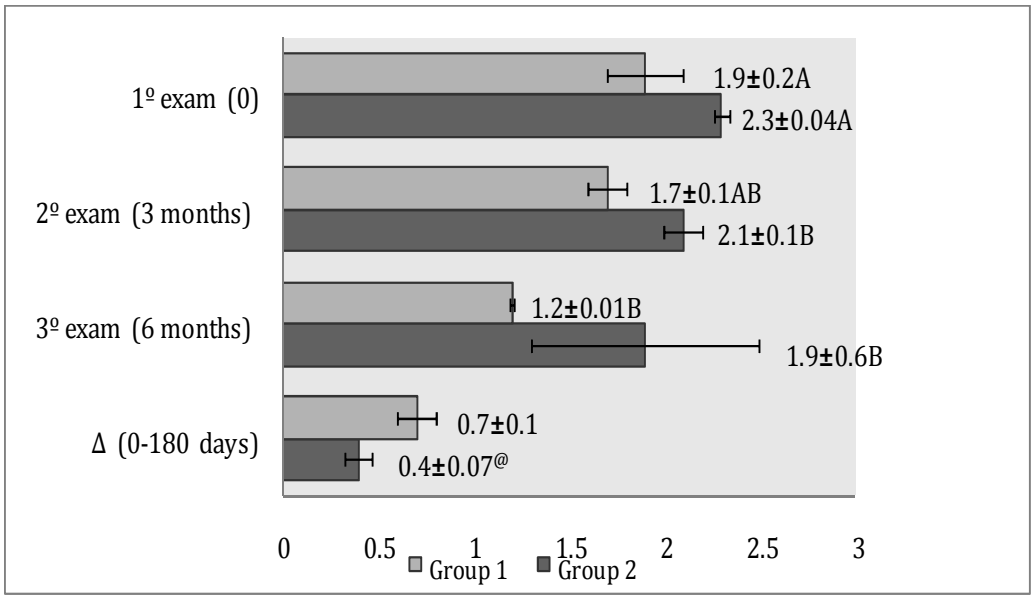

Fig. 3. Values of probing depth in both groups during periods of 0, 3 and 6 months. The results are expressed in millimeters. Different letters, (p< 0.05) data statistically different within the same group. @ (p<0.05) statistically different data among the groups

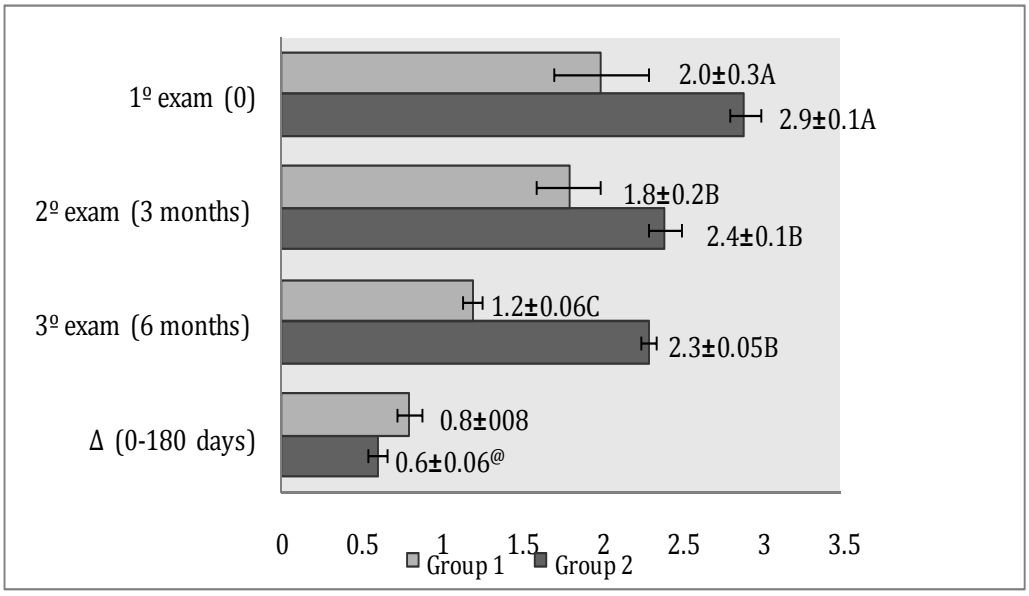

Fig. 4. Values of level of insertion in both groups during periods of 0, 3 and 6 months. The results are expressed in millimeters. Different letters, (p< 0.05) data statistically different within the same group. @ (p<0.05) statistically different data among the groups

Nevertheless, the results found in a study conducted by Kardesler et al. [16] showed that the sample volume collected from GCF was significantly increased while the total amount of IL1-ß was significantly lower in the DM group than in PD. The DM group showed in the total quantity of GCF a significantly increased level of tissue plasminogen activator (t-PA), plasminogen activator inhibitor 2 (PAI-2), IL1-ß and prostaglandin E2 (PGE2) when compared with the healthy group (control).

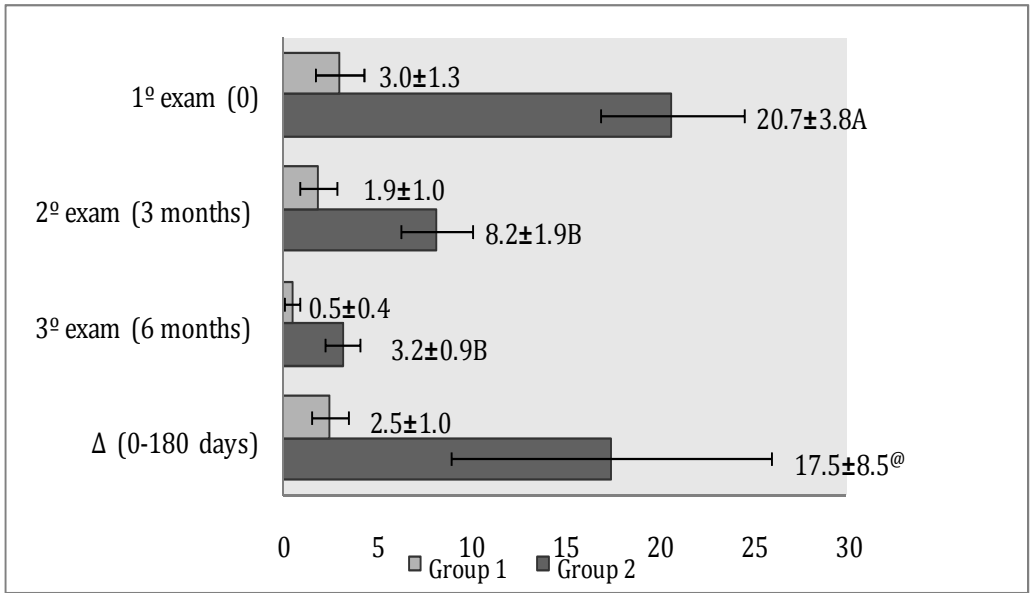

Fig. 5. Values of bleeding on probing in both groups during periods of 0, 3 and 6 months. The results are expressed in percentage. Different letters, (p< 0.05) data statistically different within the same group. @ (p<0.05) statistically different data among the groups

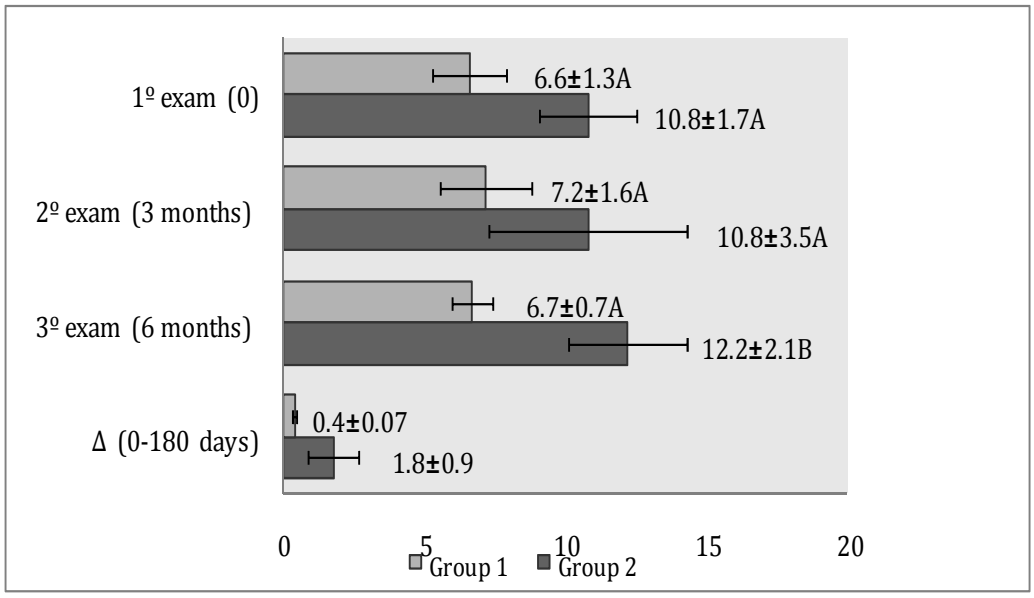

Fig. 6. Values of glycated hemoglobin in both groups during periods of 0, 3 and 6 months. The results are expressed as mean percent values. Different letters, (p<0.05) data statistically different within the same group

Thus, after periodontal evaluation of 6 months, it was possible to observe that there is a decrease of the clinical parameters evaluated, and in the group of moderately compensated diabetic patients the reduction was more pronounced than in the group of decompensated diabetic patients at the end of 6 months. Interestingly, the same occurs regarding amount of GCF. However, when comparing the parameters of glycemic control, we observed a significant reduction in fasting glucose levels only in group 1, while in group 2 there was a significant

increase. But as for the HbA1c, in the group of moderately compensated patients there was a maintenance in values, while in the group of decompensated patients there was a significant increase after the trial period of 6 months, showing that the moderately compensated patients have a most effective response to periodontal treatment.

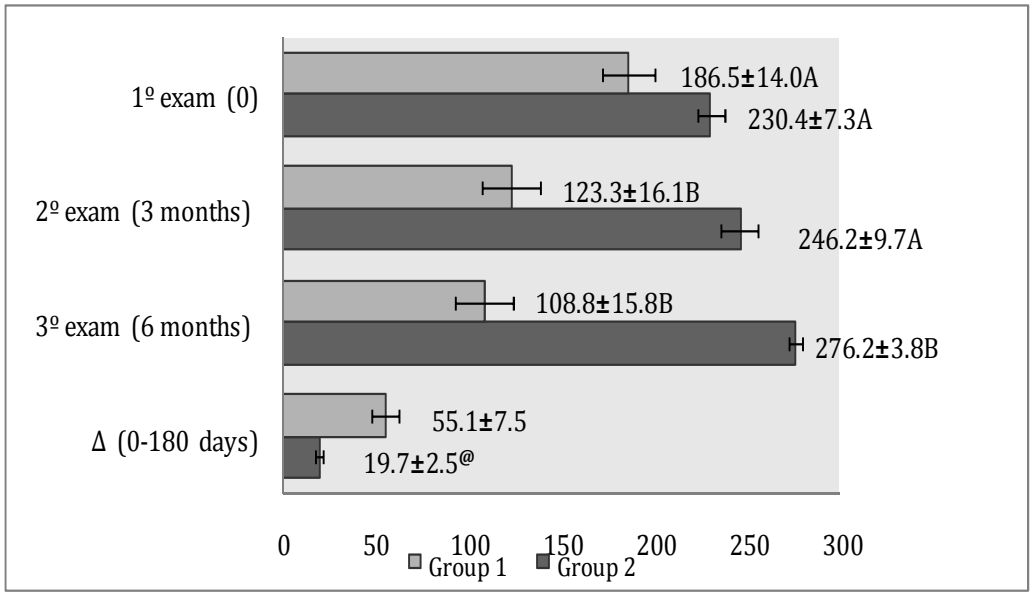

Fig. 7. Values of fasting glucose in both groups during periods of 0, 3 and 6 months. The results are expressed in mg/dL. Different letters, (p< 0.05) data statistically different within the same group. @ (p<0.05) statistically different data among the groups

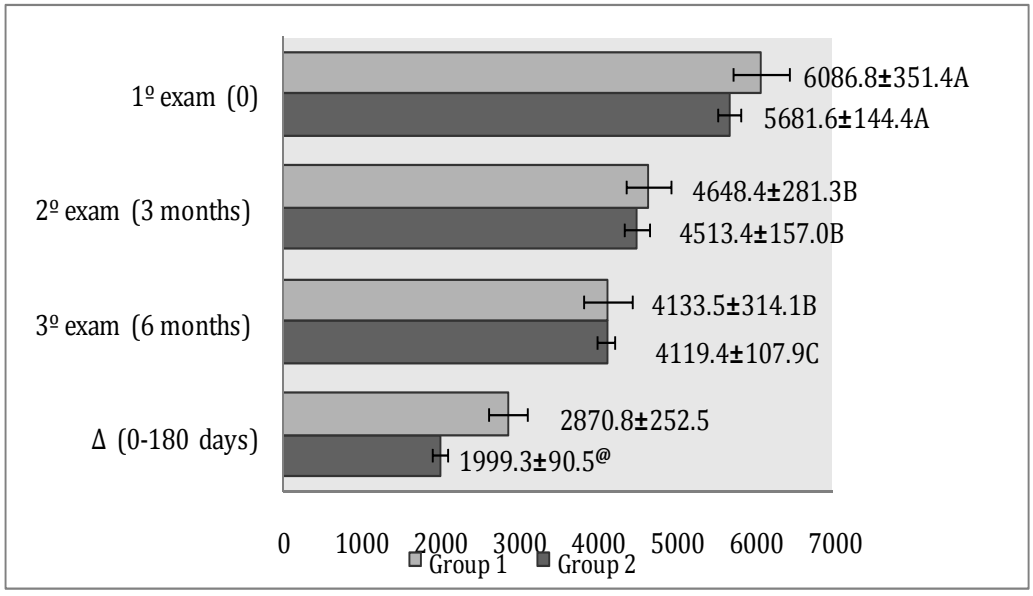

Fig. 8. Values of the area of gingival crevicular fluid in both groups during periods of 0, 3 and 6 months. The results are expressed in square pixels. Different letters, (p< 0.05) data statistically different within the same group. @ (p<0.05) statistically different data among the groups

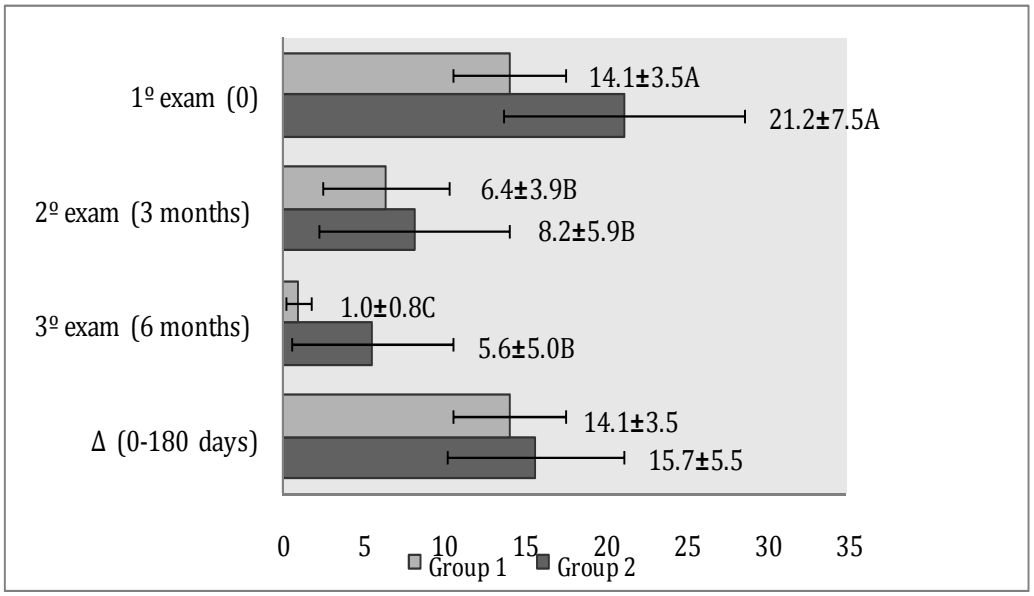

Fig. 9. Values of the expression of IL1-β in both groups during periods of 0, 3 and 6 months. The results are expressed as mean values in µg/mL. Different letters, (p< 0.05) data statistically different within the same group

As the chronic and recurrent inflammation contributes to a strong continuation of the acute phase response and can lead to complications of diabetes, such as micro and macroangiopathy and impaired healing, it is suggested that the periodontal disease with increased inflammatory response at local and systemic levels can collaborate to the insulin resistance presented in the pathogenesis of type 2 diabetes mellitus [20]. Thus, it is important to understand the possible relationship between the treatment of periodontitis and the metabolic control of diabetes mellitus, since the treatment of periodontitis in these patients may lead to reduction in soluble mediators responsible for the destruction of periodontal tissues and reduce insulin resistance in tissues [21].

5. CONCLUSION

We can conclude, therefore, that the basic periodontal treatment (scaling and conventional root planing) was more effective in the glycemic control of patients with moderately compensated type 2 diabetes than in decompensated patients.

As the results of this study were based on a small sample of patients and for a short period of time (6 months), larger studies are needed to confirm these findings and demonstrate an association between glycemic control of diabetes mellitus and the response of these patients to basic periodontal treatment.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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