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## ORIGINAL RESEARCH

### Assessment of GCF $\beta$ -glucuronidase level in diabetic and non-diabetic patients with chronic periodontitis

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#### ABSTRACT:

**Background:**  $\beta$ -glucuronidase ( $\beta$ G) is one of the enzymes found in GCF that is involved in degradation of the ground substance and fibrillar components of host connective tissue. GCF  $\beta$ G activity might be a good indicator or predictor of periodontal disease activity. **Material and method:** 72 patients were enrolled in this study. These patients were divided into two groups of 36 each: Group 1: 36 diabetic patients with clinical and radiographic diagnosis of chronic periodontitis and Group 2: 36 non-diabetic patients with clinical and radiographic diagnosis of chronic periodontitis. All demographic data of these patients was obtained. Detailed clinical examination was carried out and subsequent data was recorded. Radiographic records were also obtained to evaluate the extent and severity of periodontal disease. A single test site was selected from each patient of Group 1 and 2. After light supragingival scaling, a standard volume of 0.6  $\mu$ l GCF was collected. Collected GCF was immediately transferred to 150 micro litre of normal saline and sent to the laboratory for analysis. **Results:** Out of 36 patients in the diabetic group 19 were below 35 years of age. In the non-diabetic group 16 patients were below 35 years of age. It was seen that in the diabetic group 18 were males and 18 were females. In the non-diabetic group however 21 out of 36 patients were males. Mean GCF  $\beta$ -glucuronidase levels in the diabetic group with chronic periodontitis was 38.12. Mean GCF  $\beta$ -glucuronidase levels in the non-diabetic group with chronic periodontitis was 28.13. The standard deviation values of group 1 and group 2 were 15.53 and 12.86 respectively. Mean GCF  $\beta$ -glucuronidase levels in the diabetic group was significantly higher than the non-diabetic group with P-value of 0.00. **Conclusion:** Elevated levels of GCF  $\beta$ -glucuronidase were observed in patients with chronic periodontitis. The levels were even higher in diabetic patients.

**Key words:**  $\beta$  - Glucuronidase, chronic periodontitis, diabetes, GCF

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#### INTRODUCTION

According to World Health Organization, the term "diabetes mellitus" (DM) describes a metabolic disorder of multiple etiology characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolisms due to defects in insulin secretion and/or activity. The condition is considered the major epidemic of the century affecting more than 340 million of people around the world<sup>1</sup>.

Gingival Crevicular Fluid (GCF) provides a non invasive means of studying the host response factor by change of constituents in the fluid. The inflammatory exudates from gingival microcirculation crosses inflamed periodontal tissue and en route

collects molecules of potential interest from the local inflammatory reaction. Therefore, the fluid offers a great potential source of factors like enzymes that may be associated with tissue destruction<sup>2</sup>. Among the various enzyme systems that are released by inflammatory cells, Beta Glucuronidase (BG) is considered to be a marker for primary granule release by neutrophils. Beta Glucuronidase is a PMN derived lysosomal acid hydrolase, which is stored in primary azurophil granules and it contributes to non-collagenous matrix degradation in periodontal diseases<sup>3</sup>.

Periodontal disease has been shown to be more severe in diabetics as compared to non-diabetics.<sup>4</sup> Significant

progressive destruction of periodontal apparatus occurs in diabetics as compared to non-diabetics and significantly higher level of  $\beta$ -Glucuronidase levels exists in patients with poorer diabetic control<sup>5</sup>. Hence, this study was carried out to assess GCF  $\beta$ -glucuronidase level in diabetic and nondiabetic patients with chronic periodontitis.

### MATERIAL AND METHODS

The purpose of this study was to assess and compare GCF  $\beta$ -glucuronidase level in diabetic and non-diabetic patients with chronic periodontitis. In all 72 patients were enrolled in this study. These patients were divided into two groups of 36 each:

- Group 1: 36 diabetic patients with clinical and radiographic diagnosis of chronic periodontitis
- Group 2: 36 non-diabetic patients with clinical and radiographic diagnosis of chronic periodontitis

The patients were also informed about the purpose of the study. Written consent was obtained. All demographic data of these patients was obtained. Detailed clinical examination was carried out and subsequent data was recorded. Radiographic records were also obtained to evaluate the extent and severity of periodontal disease. Patients with systemic diseases an immune-compromised status were excluded from the study.

A single test site was selected from each patient of Group 1 and 2. After light supra-gingival scaling, a standard volume of 0.6  $\mu$ l GCF was collected. Collected GCF was immediately transferred to 150 micro litre of normal saline and sent to the laboratory for analysis.

Entire data was recorded in the Microsoft excel sheets. SPSS software was used for statistical analysis. Chi square test and student T test were use to compare the variables. P-value of less than 0.05 was considered significant.

### RESULTS

The purpose of this study was to assess and compare GCF  $\beta$ -glucuronidase level in diabetic and non-diabetic patients with chronic periodontitis. From the data collected it was seen that out of 36 patients in the diabetic group 19 were below 35 years of age and 17 were above 35 years of age. In the non-diabetic group 16 patients were below 35 years of age and 20 patients were above 35 years of age (table 1).

It was seen that in the diabetic group 18 were males and 18 were females. In the non-diabetic group however 21 out of 36 patients were males and the rest 15 were females (table 1).

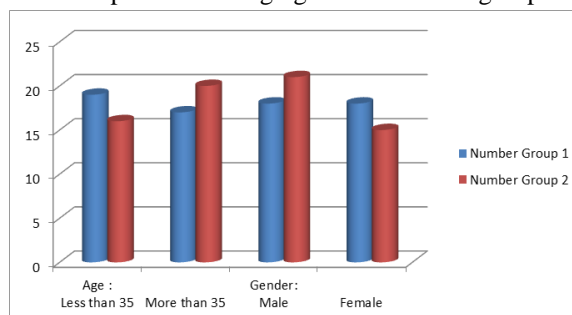
In the current study the mean GCF  $\beta$ -glucuronidase levels in the diabetic group with chronic periodontitis was 38.12. Mean GCF  $\beta$ -glucuronidase levels in the non-diabetic group with chronic periodontitis was 28.13. The standard deviation values of group 1 and group 2 were 15.53 and 12.86 respectively. When

compared statistically it was seen that the mean GCF  $\beta$ -glucuronidase levels in the diabetic group was significantly higher than the non-diabetic group with P-value of 0.00.

**Table 1:** Demographic and clinical data

Variable	Number		
	Group 1	Group 2	
Age :	Less than 35	19	16
	More than 35	17	20
Gender:	Male	18	21
	Female	18	15

**Graph 1:** The graphic representation of demographic details of patients belonging to the different groups



**Table 2:** Mean and standard deviation of GCF  $\beta$ -glucuronidase values

	Group 1	Group 2
Mean GCF $\beta$ -glucuronidase	38.12	28.13
$\pm$ SD	15.53	12.86
P-value	0.00	

### DISCUSSION

Gingival crevicular fluid (GCF) plays a special role in maintaining the structure of junctional epithelium and in the antimicrobial defense of periodontium. GCF is a complex mixture of substances derived from serum, leukocytes, structural cells of the periodontium and oral bacteria. These substances possess a great potential for serving as indicators of periodontal disease and healing after therapy. The host-derived substances in GCF include antibodies, cytokines, enzymes and tissue degradation products. The antibodies in GCF are comprised of both locally and systemically synthesized molecules, and they reflect periodontal colonization by particular microbial species<sup>6</sup>.

Much effort has been made in recent years to identify risk factors responsible for initiation and progression of periodontal diseases. Mounting evidences indicate that, gingivitis and periodontitis are caused by various host responses which are associated with the continuous presence of microorganisms in the gingival crevice<sup>7</sup>.

The association between Diabetes and Periodontal disease has received tremendous amount of evidential support over the years. The susceptibility of

individuals with diabetes to develop gingivitis and periodontitis has been reported to be higher than that in healthy subjects<sup>8</sup>. Crevicular fluid beta glucuronidase, collagenase and elastase have been detected at significantly higher levels in poorly controlled diabetic patients<sup>9</sup>.

From the data collected it was seen that out of 36 patients in the diabetic group 19 were below 35 years of age and 17 were above 35 years of age. In the non-diabetic group 16 patients were below 35 years of age and 20 patients were above 35 years of age (table 1). Aarti Chowdhary et al compared and correlated GCF beta-Glucuronidase with periodontal status among diabetic and non-diabetic patients with chronic periodontitis. A total number of 75 patients were equally divided into Group I (control group), Group II (non diabetic with chronic periodontitis) and Group III (diabetic with chronic periodontitis). Clinical parameters like Plaque index, Gingival index, Probing Pocket Depth and RBS were recorded. The beta-Glucuronidase level in GCF of all three groups was determined by spectrophotometric analysis. It was observed that the periodontitis patients irrespective of their diabetic status, showed increased periodontal destruction with elevated level of beta-Glucuronidase than the controls. Also, the diabetic patients showed increased severity of periodontal destruction and the elevated level of beta-Glucuronidase, thus indicating diabetics at a higher risk for progressive periodontal destruction<sup>10</sup>.

It was seen that in the diabetic group 18 were males and 18 were females. In the non-diabetic group however 21 out of 36 patients were males and the rest 15 were females (table 1). Jaiganesh Ramamurthy et al estimated the salivary beta glucuronidase ( $\beta$ ) activity in patients with chronic periodontitis with and without diabetes mellitus and evaluated the relationship between Beta Glucuronidase activity and Periodontal clinical parameters. The study consisted of 80 patients of both sexes with age ranging from 20-60 years and they were divided into four groups. Clinical parameters such as Gingival index, Probing depth and Clinical attachment loss were measured. Salivary Beta Glucuronidase activity was measured using spectrophotometer with reagents like phenolphthalein glucuronic acid, phosphate and glycine buffer. The mean BGA activity of Group IV ( $1.17 \pm 0.27$ ) was significantly higher than mean BGA levels of Group I, II, III. The p-value was  $< 0.05$ . The mean BGA levels of Group III ( $0.78 \pm 0.17$ ) was significantly higher than mean BGA levels of Group I, Group II at 5 % level. There was a significant positive linear relationship between salivary  $\beta$  Glucuronidase level and Probing Depth, clinical attachment level in the experimental Groups. The salivary  $\beta$  Glucuronidase level was higher in Diabetic patients with periodontitis than nondiabetic periodontitis patients<sup>11</sup>.

In the current study the mean GCF  $\beta$ -glucuronidase levels in the diabetic group with chronic periodontitis

was 38.12. Mean GCF  $\beta$ -glucuronidase levels in the non-diabetic group with chronic periodontitis was 28.13. The standard deviation values of group 1 and group 2 were 15.53 and 12.86 respectively. When compared statistically it was seen that the mean GCF  $\beta$ -glucuronidase levels in the diabetic group was significantly higher than the non-diabetic group with P-value of 0.00. Priscila Larcher Longo et al evaluated whether T2DM and glycemic control interfere in inflammatory markers profiles in gingival crevicular fluid (GCF) in periodontitis patients. Fourteen diabetic periodontitis patients were enrolled in this study, seven with adequate glycemic control (glycated hemoglobin [HbA1c]  $< 8.0\%$ ) (DMA + P) and seven with inadequate control (HbA1c  $\geq 8.0\%$ ) (DMI + P). Seven chronic periodontitis patients without diabetes formed the control group (P). GCF was obtained from diseased sites (probing depth  $> 6$  mm) of an entirely hemiarch, pooled and cytokines levels determined using multiplex beads immunoassay. Clinical periodontal parameters were analyzed by Mann-Whitney test and levels of cytokines by Kruskal-Wallis and Dunn's multiple comparison tests with confidence level of 95% ( $P < 0.05$ ). Cytokines profile of GCF obtained from deep periodontal pockets presented high levels of inflammatory cytokines, and there were no statistical differences between levels of interleukin-6 (IL-6), IL-8 and tumor necrosis factor- $\alpha$  according to presence of diabetes or percentage of HbA1c among the groups, despite groups with T2DM and periodontitis exhibit higher levels of PD. Within the limitations of this study, inflammatory mediators in GCF are dependent to the local response and do not correlate with the diabetic status<sup>12</sup>.

## CONCLUSION

From the above study it was concluded that elevated levels of GCF  $\beta$ -glucuronidase were observed in patients with chronic periodontitis. The levels were even higher in diabetic patients. Further studies are recommended.

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