

A COMPARATIVE EVALUATION OF SERUM GAMMA GLUTAMYL TRANSFERASE AND CREATININE PHOSPHOKINASE IN DIABETIC AND NON DIABETIC PATIENTS WITH CHRONIC PERIODONTITIS

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ARTICLE INFO

Article History:

Received 7th April, 2017

Received in revised form 10th May, 2017

Accepted 20th June, 2017

Published online 28th July, 2017

Key words:

Gamma glutamyltransferase, Creatinine phospho kinase, diabetes, periodontitis.

ABSTRACT

Background: Serum gamma glutamyltransferase (GGT) is an enzyme responsible for the extracellular catabolism of glutathione could reflect several processes relevant to pathogenesis. Creatinine Kinase (CK) is expressed by various tissues which may be associated with the production and accumulation of proinflammatory cytokines in relation to periodontal diseases.

Aim: This study is to assess the levels of serum GGT and CPK in chronic periodontitis Patients with diabetes and without diabetes before and after phase I therapy.

Materials and methods: A total of 20 patients with chronic periodontitis were taken and equally divided into two groups, GroupA with diabetes and Group Bwith non diabetes. All clinical parameters like Gingival Index[GI], Plaque Index [PI], Probing Pocket Depth[PPD], Clinical Attachment Level[CAL] & biochemical parameters like serum Gamma glutamyl transferase [GGT], Creatinine phosphokinase[CPK] levels were evaluated at baseline and three months after SRP.

Results: The present study showed a significant correlation of serum GGT and CPK in both GroupA & GroupB and these levels were elevated more in diabetic compared to non diabetic with chronic periodontitis.

Conclusion: There is a significant relation of parameters with diabetes and chronic periodontitis. The increased values of serum GGT and CPK before phaseI therapy showed a significant reduction after phase Itherapy.

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INTRODUCTION

Periodontitis is a multifactorial, chronic inflammatory disease which is caused due to destruction of periodontal tissues by Gram-negative anaerobic bacteria.¹ It is highly prevalent (severe periodontitis affects 10-15% of adults) and has multiple negative impacts on quality of life.²

Diabetes is a major risk factor for periodontitis. There is two-way relationship between diabetes and periodontitis, with diabetes increasing the risk for periodontitis and periodontal inflammation negatively affecting glycaemic control.²

Serum gamma glutamyltransferase (GGT) is an ectoplasmic enzyme responsible for the extracellular catabolism of glutathione, which is synthesized in epithelial cells of the intrahepatic duct and distributed in different cells with various secretory or absorptive activities. It has an important role in glutathione homeostasis by initiating the breakdown of extracellular glutathione and turnover of vascular glutathione. Considering the antioxidant activity of glutathione, increased level of GGT may be linked to greater oxidative stress.

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Increased oxidative stress has β cell dysfunction and reducing insulin action. Therefore, serum GGT activity could reflect several different processes relevant to diabetes pathogenesis.³

Creatine kinase (CK) also known as creatine phosphokinase (CPK) or phospho-creatine kinase is an enzyme which is expressed by various tissues, cell types and catalyses the conversion of creatine found in the heart, brain, skeletal muscle and other tissues, the cells become damaged in periodontitis due to oedema or destruction of a cellular membrane, as a result there is an increased amounts of ck levels were release into the gingival crevicular fluid, saliva, blood where their activity can be measured.⁴

Hence the aim of the present study is to assess the levels of serum GGT and CPK in diabetic and non diabetic patients with chronic periodontitis before and after phase I therapy.

MATERIALS AND METHODS

Twenty subjects of aged between 35- 60 years were selected from the outpatient sector of Department of Periodontics, St. Joseph Dental College, eluru during the period of Aug 2016 to Dec 2016. All 20 subjects fulfilled the inclusion criteria for the study, which includes the age limit and other systemically

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healthy patients except diabetes who were eligible to participate in the trial. The patients were assigned into two groups of 10 each Group A [Diabetic with chronic periodontitis], Group B [Non diabetic with Chronic Periodontitis]. The patients with a history of periodontal treatment within the Past 6 months, under any medication, patients who have smoking habit, pregnant and lactating women and with history of any viral infection in past 6 months were excluded from the study. Subjects fulfilling the selection criteria were chosen successively and ethical clearance was obtained from the institutional review board. Admissible information regarding the study protocol was illuminated to each patient, and written informed consent was obtained from all participants. The routine biochemical investigations like Hb%, CT, BT, TC, HBsAG, tridot and a confirmatory test for diabetes was done using spectrophotometric method (glucose oxidase-peroxidase, Bosnalijek). After the confirmatory test of diabetes is recorded then the patient is divided according to classification given by American Diabetes Association ⁵.

Periodontal parameters

A complete periodontal examination, includes: gingival index (GI), plaque index (PI), bleeding on probing (BOP), probing depth (PD), clinical attachment loss (CAL) were recorded⁴ at baseline and 3 months after phase 1 therapy (scaling and root planning).

Measurement of serum GGT and CK levels

At baseline 5 mL of blood samples were collected from a vein in the antecubital region of each patient. After collecting, the blood samples were centrifuged at 3500 revolutions/min for 10 min at 4°C and GGT samples were sent to thyrocare labs, analyzed by enzymatic photometry method using ParsAzmoon kit (TehranIran) and CPK samples were sent to Dr.Lalpath labs and the activity of creatine kinase was analysed by CK NAC activated test kit (Biosystems, Inc, kinetic uv test). The same procedure was repeated after 3 months of phase 1 therapy (scaling and root planning) to compare the values of CPK & GGT before and after the treatment.

Statistical analysis

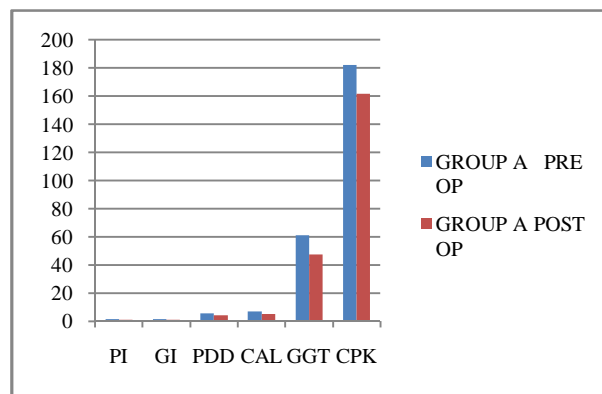
Statistical analysis was performed using a Graphpad prism7. Periodontal parameters and serum CK and GGT levels were compared between the groups using PAIRED T test of variance. $P < 0.05$ was considered statistically significant.

RESULTS

The means of PI, GI, PD, CAL, GGT, and CPK in Group A at baseline and 3 months after srp showed a statistical significance. The mean and p values of PPD, CAL, GGT showed more significance than GI, CPK followed by PI (table 1). The mean and p values at baseline showed a significant reduction of means at 3 months after srp.

Table 1 Comparison of Mean, Standard Deviation Values of Clinical Parameters In Diabetic Patients

Parameters	Pre Operative		Post Operative		P Value
	MEAN	SD	Mean	SD	
PI	1.895	0.452432	1.465	0.238106	0.0011
GI	1.775	0.409098	1.375	0.282105	0.0002
PPD	5.9	0.875595	4.4	0.699206	<0.0001
CAL	7.2	1.75119	5.5	1.78511	<0.0001
GGT	61.5	8.488554	47.6	8.085653	<0.0001
CPK	182.4	15.07168	161.9	6.10091	0.0002

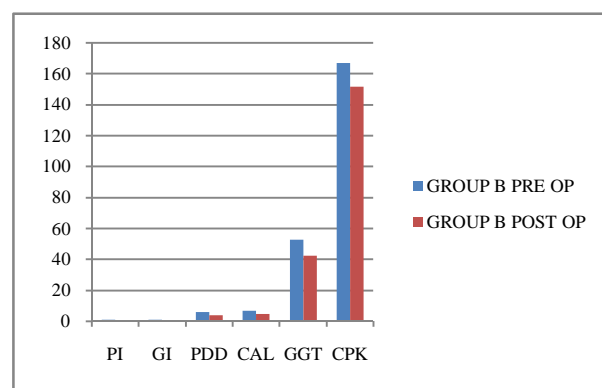


Graph 1 Comparison of Mean, Standard Deviation Values of Clinical Parameters in Diabetic Patients

The means of PI, GI, PD, CAL, GGT, and CPK in Group B at baseline and 3 months after srp showed a more statistical significance (table 2). The mean and p values at baseline showed a significant reduction compared to means at 3 months after srp. The P values of clinical parameters in Group B showed a more statistical significance than Group A.

Table 2 Comparison of Mean and Standard Deviation Values of Clinical Parameters in Non Diabetic Patients

Parameters	Pre operative		Post operative		P Value
	MEAN	SD	MEAN	SD	
PI	1.41	0.260128	0.8	0.176383	<0.0001
GI	1.42	0.204396	0.85	0.217307	<0.0001
PD	6.2	0.788811	4.3	0.674949	<0.0001
CAL	7	0.471405	5	0.471405	<0.0001
GGT	53.12	8.839281	42.56	8.739591	<0.0001
CPK	167.1	12.98247	152	14.16569	<0.0001



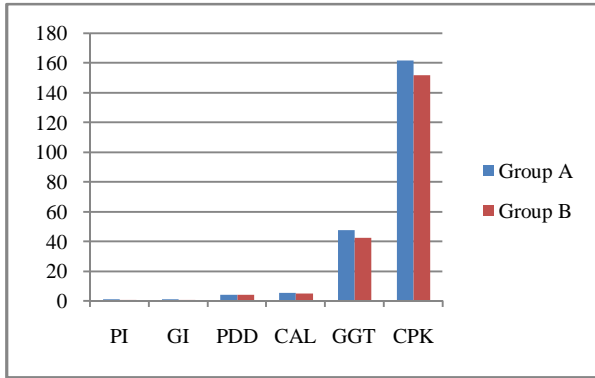
Graph 2 Comparison of Mean And Standard Deviation Values of Clinical Parameters In Non Diabetic Patients

But the intergroup comparison of Group A and Group B didn't show a statistical significance except in plaque index [PI] p value (<0.0001) (table 3)

Table 3 Comparison of Mean And Standard Deviation of Clinical Parameters In Diabetic And Non Diabetic.

Parameters	Post Diabetic		Post non diabetic		P VALUE
	MEAN	SD	MEAN	SD	
PI	1.465	0.238106	0.8	0.176383	<0.0001
GI	1.375	0.282105	0.85	0.217307	0.0002
PD	4.4	0.699206	4.3	0.674949	0.7486
CAL	5.5	1.78511	5	0.471405	0.2289
GGT	47.6	8.085653	42.56	8.739591	0.1974
CPK	161.9	6.10091	152	14.16569	0.0574

Intergroup comparison



Graph 3 Comparison of Mean And Standard Deviation of Clinical Parameters In Diabetic And Non Diabetic

DISCUSSION

Periodontitis increases approximately by threefold in diabetic individuals compared with non-diabetic individuals². The frequency of people with diabetes has been increasing rapidly. So, the need for early recognition and treatment of periodontitis in diabetes may prevent the further complications.

The two way relationship between diabetes and periodontitis have been documented², thus the clinical evidence provides strong support that periodontal infection contributes to worsening of glycemic control in individuals with diabetes. Hence, there are many biomarkers related to periodontitis and diabetes like CRP, ALT, AST etc off these GGT and CPK may be used to assess future risks of diabetic complications and other systemic diseases by showing an abundant evidence of increased serum levels in alcohol consumption, liver diseases, glucose levels, etc⁶.

GGT is a cell surface protein and induces osteoclast differentiation by increasing production of the factor “receptor activator of NF- κ B ligand” (RANKL), which is a member of the TNF family of cytokines and plays a key role in bone resorption^{7,8} in osteoblasts and bone marrow cells.

The possible relationship between serum CK levels and periodontal disease may be associated with the production and accumulation of proinflammatory cytokines (such as interleukin [IL] 1 β , IL-6, and IL-1) in the gingival crevicular fluid of patients with periodontal disease⁹.

In the present study there was a significant reduction of PI, GI, CAL, and PPD in both the groups after srp compared to baseline considering periodontal therapy eliminated all the etiological factors which played a role in the initiation and progression of the disease

The mean values of ggt (61.5) and cpk (182.4) in group A at baseline showed a significant reduction to the mean values of ggt (47.6) and cpk (161.9) at the end of 3 months after srp. Therefore, the possibility difference in the GGT & CPK levels in diabetes could be the mechanism which includes the pro-inflammatory cytokines such as TNF- α , IL1- β , IL-6 and IF- γ are produced by inflamed periodontium as well it interferes with glucose and lipid metabolism, resulting in decreased insulin production by causing apoptotic cell death of pancreatic β cells, thereby leading to a vicious cycle.¹⁰

So, SRP may decrease serum levels of these pro-inflammatory mediators, which can control the inflammation, insulin resistance and decrease the systemic level of sugar and the enzymatic levels of GGT and CPK which is in accordance to the study done by Shital Hungund and Bhruvish J. Panseriya *et al.*¹¹ showed the effectiveness of srp in periodontal disease with and without diabetes.

The mean values of ggt(53.1) and cpk(161.9) in group B at baseline shows a significant reduction to the mean values of ggt(42.5) and cpk(152) at the end of 3 months after srp. However, SRP may reduce the severity of periodontal infection and decrease the systemic burden of inflammatory mediators which in turn may reduce the hyperglycaemic state in borderline diabetic patients.

Thus, this study has a strong correlation between serum CK and GGT levels in diabetes with periodontitis and controlled GGT and CK levels were associated with good glycemic control which is in accordance with Adlija Jevric -Causevic¹² Charumathi Sabanayagam¹³ *et al.* The serum GGT may be reported as a biomarker of metabolic syndrome, cardiovascular diseases and type 2 diabetes which is in accordance to NORIYUKI NAKANISHI *et al.*¹⁴ Nakanishi *et al.*¹⁵ Sabanayagam *et al.*¹³.

Limitations in this study are lack of prolonged follow up over years, less sample size. To the best of our knowledge from induced literature the present study is the first one to assess the relationship between GGT and CPK in diabetes after SRP. Therefore it may throw some light in this field and highlights need for more research in this area.

CONCLUSION

Within limitations of the study, an increased level of GGT&CPK before SRP showed a significant reduction level after SRP. This may predict the future risk of cardiovascular diseases and other systemic diseases in chronic periodontitis patients with diabetes and without diabetes. Further studies with large samples are needed regarding serum GGT &CPK for the better results.

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How to cite this article:

Pavuluri Aravind Kumar *et al* (2017) 'A Comparative Evaluation of Serum Gamma Glutamyl Transferase and Creatinine Phosphokinase in Diabetic and Non Diabetic Patients with Chronic Periodontitis', *International Journal of Current Advanced Research*, 06(07), pp. 4837-4840. DOI: <http://dx.doi.org/10.24327/ijcar.2017.4840.0594>
