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Research paper

Does periodontal inflammation affect glycosylated haemoglobin level in otherwise systemically healthy individuals? – A hospital based study

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ABSTRACT

Background and objectives: Microbial biofilm and host susceptibility play an important role in the initiation and progression of periodontitis. Periodontitis is considered the sixth complication of diabetes mellitus and a bidirectional relationship exists between diabetes and periodontitis. This cross-sectional observational study was undertaken to evaluate the glycosylated haemoglobin (HbA1c) level in chronic periodontitis.

Methods: The study involved 100 subjects. The case group consisted of 50 subjects with chronic periodontitis and the control group consisted of 50 periodontally healthy subjects. Periodontal parameters including plaque index, oral hygiene index, modified gingival index, probing pocket depth, and clinical attachment level were measured and recorded. Systemic parameters like Body Mass Index (BMI), Waist Hip Ratio (WHR), C- Reactive Protein (CRP), Glycosylated haemoglobin (HbA1c), lipid profile, fasting blood sugar, post prandial blood sugar and serum albumin were assessed in all subjects.

Results: The mean HbA1C for the case group was 6.27 ± 1.5 and for the control was 5.36 ± 0.4 and the difference was statistically significant ($p = 0.001$). The mean FBS, PPBS, LDL, WHR, CRP was statistically significant between groups ($p \leq 0.05$). Periodontal parameters like PI, OHI, MGI, PD and CAL were significantly higher in the case group than the control group (p value ≤ 0.05). The multivariate linear regression model with the dependent variable HbA1c showed chronic periodontitis was significantly associated with HbA1c level.

Conclusion: In chronic periodontitis patients (otherwise systemically healthy) the presence of periodontal inflammation affected the glycosylated haemoglobin level and they were in prediabetes stage. Therefore, it is plausible that the prediabetes stage might be reduced via appropriate periodontal therapy.

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Introduction

Periodontal disease is a common, chronic, immunoinflammatory disease characterized by the destruction and loss of connective tissue attachment. Mounting evidences suggest that microbial biofilm and host susceptibility play an important role in the initiation and progression of periodontitis [1]. Recent studies have demonstrated that chronic periodontitis is a potential risk factor for systemic diseases like coronary heart diseases/atherosclerosis and worsening of glycemic control in diabetes mellitus [2,3].

The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus identified a group of individuals whose glucose level were higher than normal but not high enough to be classified as diabetic. This intermediate group of individuals was defined as having impaired fasting glucose (IFG) or impaired glucose tolerance (IGT) and they were at high risk for the future development of diabetes. In 2009, International Expert Committee recommended HbA1C test as one of the available tests to diagnose diabetes and those at high risk of developing diabetes in the future. According to "American Diabetic Association" (ADA), the term pre-diabetes may be applied to individuals whose HbA1C fall within the range of 5.7–6.4% and considered at high risk for the future development of diabetes [4].

Periodontal disease has now been recognized as the sixth complication of diabetes [5]. Evidences in recent literature support the existence of bidirectional link between chronic periodontitis and diabetes mellitus [6,7]. The association between periodontitis and impaired glucose metabolism has not been completely revealed at the molecular and cellular level. Once the inflammatory mediators produced by periodontal pathogen gain access into systemic circulation, it could lead to a low-grade inflammatory burden and eventually insulin resistance [8]. Although many studies reported the association between periodontitis and diabetes mellitus, the impact of periodontitis on prediabetes is unclear. Very few studies are available in current literature addressing the impaired fasting glucose level in periodontitis [9,10]. These existing studies suggest that periodontitis may affect glucose metabolism in the general population, albeit to a lesser extent than in adults with diabetes.

So it was hypothesized that patients with periodontitis have higher HbA1c levels than healthy patients. This study aimed to assess glycosylated haemoglobin levels in otherwise systemically healthy individuals with chronic periodontitis. The secondary objective of this study was to correlate the levels of HbA1c, inflammatory markers like serum albumin and CRP with periodontal parameters.

Materials and methods

This cross- sectional study was conducted in the Department of Periodontics, Govt. Dental College, Calicut, in collaboration with Department of Biochemistry, Govt. Medical College, Calicut.

It was calculated that a sample of 50 cases and 50 controls provided the study with 90% power to detect a 0.4% difference between groups when alpha was set at 0.05 and with an estimated sample standard deviation of 0.6%. The expected difference between groups was based on the weighted value reported in a meta-analysis of HbA1c changes after periodontal treatment in patients with diabetes [11].

The duration of the study was 14 months from June 2012 to August 2013. The study was approved by the Institutional Ethics Committee, Govt. Dental College, Calicut, and informed consent was obtained from the study subjects. A total of 105 subjects were selected, 100 subjects agreed to participate in the study; five subjects (2-controls and 3-cases) were not willing to participate in the study and were excluded.

The case group consisted of 50 otherwise systemically healthy subjects with chronic periodontitis comprising of eight moderate chronic periodontitis and forty-two severe chronic periodontitis subjects. Patients with chronic periodontitis were recruited from the out-patient wing of Department of Periodontics, Govt. Dental College, Calicut, after clinical diagnosis of chronic periodontitis. The diagnostic criterion for periodontitis was based on American Academy of Periodontology's criteria 1999, and clinical case definitions proposed by the CDC working group for use in population-based surveillance of periodontitis by the Division of Oral Health (DOH), and Centres for Disease Control and Prevention (CDC), in collaboration with the American Academy of Periodontology definitions [12].

The control group consisted of 50 periodontally healthy subjects and/or those with mild periodontitis and were selected from faculty and other staff of Government Dental College, Calicut.

Inclusion criteria for case group were, chronic periodontitis patients with age between 25 to 55, minimum of 20 teeth, and no family history of diabetes. The control group was selected on the basis of same inclusion criteria as that of case group, but without moderate or severe chronic periodontitis (CDC criteria).Exclusion criteria included patients with known systemic diseases and conditions such as CVD, renal disease, rheumatoid arthritis, diabetes mellitus, liver and pancreatic diseases, nutritional deficiencies, pregnant and lactating mother, haemolytic anemia and subjects who received systemic antibiotic therapy within the preceeding 6 months and periodontal therapy within the last one year.

Subjects were evaluated using a detailed questionnaire regarding their medical and social history, age, family income, education, diet, occupation, eating habit, smoking habit, oral hygiene practice habit, family and individual history of diabetes, hypertension, and previous drug allergy. Oral and periodontal examination included bleeding from gum, pus discharge from gum, abscess, mobility of teeth, caries exposure, plaque index, simplified oral hygiene index (OHI-s), modified gingival index (MGI), probing pocket depth (PPD) and clinical attachment level(CAL).Systemic and biochemical parameters like height, weight, body mass index (BMI), waist hip ratio (WHR), C-reactive protein (CRP), glycosylated haemoglobin(HbA1c), total cholesterol (TCHO), triglycerides (TG), high density lipoprotein (HDL), low density