

Salivary C-peptide, a useful biochemical marker for insulin-dependent diabetes mellitus

Dr. Natheer H. Al-Rawi B.D.S, M.Sc, PhD Assistant Professor *

Abstract: Insulin-dependent diabetes mellitus (IDDM) is characterized by complete destruction of β -cells, this result in little or no production of insulin & /or C-peptide which is a portion of insulin & is released in amounts equal to the insulin. C-peptide level can indicate how much insulin is being produced by the pancreas.

Patients & Materials: Fifty six diabetic patients were enrolled in this study (15 IDDM & 41 NIDDM). C-peptide levels in serum & saliva were estimated using Radio-immuno assay (RIA) method, with measuring serum FBS in both groups.

Results: The serum & salivary levels of C-peptide as well as serum FBS levels were markedly higher in NIDDM than in IDDM with a significant negative correlation between salivary C-peptide & FBS in IDDM group.

Conclusion: Salivary C-peptide level estimation can be used as an adjunct to serum FBS to measure the amount of insulin produced by β -cells, as well as to measure the response of insulin therapy in IDDM.

Keywords: C-peptide, IDDM, Saliva

Introduction

Diabetes Mellitus is a chronic systemic metabolic disorder, characterized by increased level of glucose in the blood & abnormality in lipid & protein metabolism.⁽¹⁾ Two basic types of diabetes mellitus (DM) have been described: Type 1(Insulin-dependent diabetes mellitus IDDM) & Type 2 (Non-Insulin-dependent diabetes mellitus NIDDM) ⁽²⁾ . IDDM is most frequently found in young patients before 40 years of age. They always require insulin treatment, whereas NIDDM is usually diagnosed after age 45 & does no require insulin supplementation ⁽³⁾. IDDM is characterized by complete destruction of β -cells, this result in little or no production of insulin as well as C-peptide ⁽⁴⁾. C-peptide is a portion of insulin; it is released in amounts equal to insulin, so the level of C-peptide in blood can indicate how much insulin is being produced by the pancreas ⁽⁵⁾.

Saliva is a fluid which show some changes correlated with some diseases. Such alteration could be in its flow rate or in its composition as seen in diabetes mellitus ⁽¹⁾.

The aim of this study is to estimate the level of C-peptide in serum & saliva & to determine the validity of using this test as a bio-marker for differentiating between the types of diabetes (IDDM & NIDDM) for the newly diagnosed cases.

Patients & Materials

The sample is consisted of 55 diabetic patients attended Al-Kadhemiyah Teaching Hospital. They were divided into two groups according to the type of diabetes the patients have. The first group is composed of 15 IDDM of both sexes & the second group is composed of 41 NIDDM of both sexes.

Blood & saliva were collected at least 8 hours after last meal, 5ml

*Department of Oral diagnosis/ College of Dentistry, University of Baghdad

venous blood was collected from each patient, centrifuged at 2000 rpm. The supernatant was collected by micropipette & stored frozen in polyethylene tube until time of assessment. At the same time 3-5 ml of unstimulated saliva was collected after instructing patients to wash & rinse their mouth by tap water to insure the removal of any food debris & asked to collect saliva in sterile polyethylene tubes by ordinary spitting method. The collected saliva was immediately cold centrifuged at 2000 rpm & the supernatant was drawn for biochemical investigation.

FBS was performed for each patient using the routine method & C-peptide was assessed using RIA & the values measured in gamma counter.

The difference between two groups was measured using student t-test with 0.01 level of significance & Pearson correlation between two groups at 0.05 level of significance.

Results

The first group (IDDM) is composed of 15 patient (7 males & 8 females) with mean age (10.28 ± 2.6 years). The mean value of serum FBS plus serum & salivary C-peptide is shown in table (1).

The second group (NIDDM) is composed of 41 patient (20 males & 21 females) with mean age (41.65 ± 13.5 years). The mean value of serum FBS plus serum & salivary C-peptide as shown in table (1).

The serum levels of FBS as well as the serum & salivary levels of C-peptide are markedly higher in NIDDM group than in IDDM group with a highly significant statistical difference ($p < 0.001$) and the serum levels of C-peptide is slightly higher in NIDDM group than in IDDM group, but it does not reach the level of

significance ($p > 0.05$) as shown in table (2).

A non significant correlation between serum C-peptide & FBS was found in both IDDM & NIDDM group, whereas a significant negative correlation ($p > 0.05$) between salivary C-peptide & FBS was found in IDDM group but not in NIDDM group, a non significant correlation was found between serum C-peptide & salivary C-peptide in both IDDM & NIDDM group as shown in table (3).

Discussion

C-peptide levels may be ordered if we have newly diagnosed diabetes, as part of an evaluation of "residual β -cells function. The level of C-peptide in the blood can indicate how much insulin is being produced by the pancreas ⁽⁶⁾. Hsieh, et.al. (1985) proposed that a person whose pancreas is unable to produce any insulin (IDDM) usually has a decreased level of C-peptide as well as insulin & a person with NIDDM has normal or increased levels of C-peptide.

The results of the present investigation showed a marked elevation of C-peptide & FBS in NIDDM group which is three times higher than that of IDDM group. A positive correlation between serum FBS & serum C-peptide was found but it does not reach a significant level.

The decrease in the level of C-peptide in IDDM group which is about normal value may be due to the use of manmade (synthetic) insulin which does not contain C-peptide ⁽⁴⁾, or may be due to inappropriate use of insulin which also lead to lower the C-peptide levels ⁽⁷⁾. The longer half-life of C-peptide than insulin render it to persist longer in peripheral circulation ⁽⁸⁾. For this reason, plasma as well as salivary C-peptide values can measure insulin secretion more reliably than the insulin

itself & also to evaluate the response of treatment ⁽⁶⁾.

The significant negative correlation between FBS & salivary C-peptide means that the function of β -cells in insulin production is so affected to a level that makes an increase in levels of FBS & a decrease in C-peptide levels.

Serum & salivary C-peptide values were increased with the presence of hyperglycemia as seen in NIDDM group, this could be due to the retention of this biomolecule in the serum & saliva & partly due to improper filtration of C-peptide by kidney which is the major excretory site of it ⁽⁴⁾.

Up to our knowledge, this is the first study that used saliva as an easy collected fluid to measure C-peptide levels in diabetic patients.

From the results of the present investigation it can be concluded that salivary C-peptide levels estimation can be used as an adjunct to FBS for evaluation of β -cell activity in the pancreas as well as to monitor insulin therapy in IDDM patients. The test is simple & the sample can be easily

collected without the need of venepuncture.

References

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Table (1): Mean values of FBS & C-peptide in IDDM & NIDDM group

Group	FBS (mg/dl)	Serum C-peptide (umol/L)	Salivary C-peptide (umol/L)
IDDM	91.07 $\pm$ 6.82	0.628 $\pm$ 0.6	0.147 $\pm$ 0.3
NIDDM	184 $\pm$ 84.5	1.84 $\pm$ 1.35	0.336 $\pm$ 0.6

Table (2): Differences between FBS & C-peptide in IDDM & NIDDM group using t-test

Group	FBS (mg/dl)	Serum C-peptide (umol/L)	Salivary C-peptide (umol/L)
IDDM	91.07 $\pm$ 6.82	0.628 $\pm$ 0.6	0.147 $\pm$ 0.3
NIDDM	184 $\pm$ 84.5	1.84 $\pm$ 1.35	0.336 $\pm$ 0.6
IDDM vs. NIDDM	2.91 E ⁻⁰⁵ **	0.08*	7.32E ⁻⁰⁹ **

*Non Significant ** Significant at 0.001 level

Table (3) Correlation between serum & salivary C-peptide & FBS

Group	Serum C-peptide vs. FBS	Salivary C-peptide vs. FBS	Serum C-peptide vs. Salivary C-peptide
IDDM	0.33	0.04*	0.422
NIDDM	-0.12	0.17	-0.19

* Significant at 0.05 level