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Original Research Article

Correlation of Fasting & PP C-Peptide with Hba1c in Patients of T2 Diabetes Mellitus: A Retrospective Study

Anand[1], Rolly Bharty[2]

[1]Tutor, Department of Biochemistry, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar, India

[2]Assistant professor and Head, Department of Biochemistry, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar, India

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Corresponding Author: Dr. Rolly Bharty
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Abstract

Aim: The aim of the present study was to assess the correlation of Fasting & PP C-peptide with HbA1C in patients of T2 Diabetes Mellitus in population of Bihar region.

Methods: 100 patients admitted in the Department of Biochemistry, Jawaharlal Nehru Medical College, Bhagalpur, Bihar, India for one year. Serum samples were taken for fasting & PP C-peptide and HbA1C for patients of T2 Diabetes Mellitus and run on VITROS 5600/7600 which is based on dry chemistry.

Results: Mean & SD for fasting C-Peptide for males was 1.348±1.072 & for females 2.448±2.56. Mean & SD for Post prandiol C-Peptide for males was 4.210±5.025 & for females 2.995±2.134. It was significant for fasting C-Peptide with P value 0.0634 and non significant for PP C peptide with p value 0.4405. Mean & SD for fasting C-Peptide for raised was 3.379±1.791 & for unraised 0.718±0.512.

Conclusion: Insulin secretion estimated by measurement of Fasting C- Peptide was either normal or raised in newly diagnosed T2dm subjects in my study indicating predominant role of insulin resistance in the etiology.

Keywords: Fasting C--peptide, Post prandiol C-peptide, T2 Diabetes Mellitus.

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Introduction

C-peptide is the part of proinsulin which is cleaved prior to co-secretion with insulin from pancreatic beta cells. Produced in equimolar amounts to endogenous insulin, it is not a product of therapeutically administered exogenous insulin and has been widely used as a measure of insulin secretion. C-peptide is a useful and widely used method of assessing pancreatic beta cell function. [1,2] After cleavage of proinsulin, insulin and the 31-amino-acid peptide c-peptide are produced in equal amounts. [3,4] So why is c-peptide testing preferable to insulin as a guide to beta cell function? The degradation rate of c-peptide in the body is slower than that of insulin (half-life of 20–30 min, compared with the half-life of insulin of just 3–5 min), which affords a more stable test window of fluctuating beta cell response. In healthy individuals the plasma concentration of c-peptide in the fasting state is 0.3–0.6 nmol/l, with a postprandial increase to 1–3 nmol/l. [4] Half of all insulin secreted by the pancreas is metabolized in the liver by first-pass metabolism, whereas c-peptide has negligible hepatic clearance.

C-peptide is cleared in the peripheral circulation at a constant rate, whereas insulin is cleared variably making direct measurement less consistent. In insulin-treated patients with diabetes, measurement of c-peptide also avoids the pitfall of cross-reaction of assay between exogenous and endogenous insulin. C-peptide is a byproduct of the insulin synthesis from pro-insulin and roughly indicates the extent of insulin production and release. C-peptide is a biological active compound [5] and also serves as an important diagnostic biomarker. [6,7] Recently, C-peptide has been suggested as a strong indicator of metabolic syndrome suggesting the importance of this biomolecule in diagnosis of metabolic syndrome. [8] Because both metabolic syndrome and IR are associated with elevated risk for developing T2DM, it would be intriguing to investigate the biomarker potential of C-peptide for screening of IR prone individuals such as pre-diabetics and diabetics.

The degradation rate of C-peptide in the body is slower than that of insulin (half-life of C-peptide is 20-30min, compared to that of insulin is 3-5 min). In healthy individuals the plasma concentration of c-peptide in fasting state is 0.3-0.6 n mol/l and postprandiol is 1-3 n mol/l. Hb undergoes non enzymatic glycosylation in persons with persistent

hyperglycemia and designated as HbA1c. HbA1C represents the integrated values of glucose over preceding 6-8 weeks and provides an additional criterion for assessing glucose control.

The aim of the present study was to assess the correlation of Fasting & PP C-peptide with HbA1C in patients of T2 Diabetes Mellitus in population of Bihar region.

Materials and methods

100 patients admitted in the Department of Biochemistry, Jawaharlal Nehru Medical College, Bhagalpur, Bihar, India for one year. Serum samples were taken for fasting & PP C-peptide and HbA1C for patients of T2 Diabetes Mellitus and run on VITROS 5600/7600 which is based on dry chemistry.

Results

Table 1: Distribution of male and female in fasting and PP blood sugar

Parameter	Male Mean± SD	Female Mean± SD	P value
Fasting	1.348±1.072	2.448±2.564	0.0316
PP	4.212±5.022	2.984±2.132	0.3632

Mean & SD for fasting C-Peptide for males was 1.348±1.072 & for females 2.448±2.56.

Table 2: Distribution of male and female in PP blood sugar and HbA1c

Parameter	Male Mean±SD	Female Mean± SD	P value
PP	4.210±5.025	2.995±2.134	0.3634
HbA1c	9.681±3.078	10.33±2.209	0.4405

Mean & SD for Post prandiol C-Peptide for males was 4.210±5.025 & for females 2.995±2.134. It was significant for fasting C- Peptide with P value 0.0634 and non significant for PP C peptide with p value 0.4405.

Table 3: Distribution of raised and unraised in fasting and PP blood sugar

Parameter	Raised Mean± SD	Unraised Mean± SD	P value
Fasting	3.379±1.791	0.718±0.512	0.0001
HbA1c	10.12±2.702	5.468±0.154	0.0040

Mean & SD for fasting C-Peptide for raised was 3.379±1.791 & for unraised 0.718±0.512.

Discussion

Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder characterized by hypoglycemia, dyslipidemia due to deficiency or inappropriate functioning of Insulin, hypoglycemics hormone secreted by B cells of pancreas. Its incidence is increasing in the last few years in India with growth rate of 12.5%, the prevalence of Type 2 DM is 2.4% in rural population and 11.6% in urban population. [10] C-Peptide is a part of proinsulin which is cleaved prior to co-secretion with insulin from pancreatic beta cells. Produced in equimolar amounts to endogenous insulin, it is not a product of therapeutically administered exogenous insulin and has been widely used as a measure of insulin secretion. C-Peptide is a useful and widely used method of assessing pancreatic beta cell function. [11,12] After cleavage of proinsulin, insulin and (32-amino acid peptide) C-peptide are produced in equal amounts. [10,13]

Mean & SD for fasting C-Peptide for males was 1.348±1.072 & for females 2.448±2.56. Mean & SD for Post prandiol C-Peptide for males was 4.210±5.025 & for females 2.995±2.134. It was significant for fasting C- Peptide with P value 0.0634 and non-significant for PP C peptide with p value 0.4405. Mean & SD for fasting C-Peptide for raised was 3.379±1.791 & for unraised 0.718±0.512. There are different methods to measure B cell secretory function. Acute insulin response (AIR) or AIR max is the gold standard for assessment of B cell function but difficult to perform in clinical setting. [14] Assay of serum insulin as a measure of insulin has half-life 3-5 minutes and almost half of insulin secreted to pancreas is degraded by hepatic first pass metabolism. C-Peptide secreted in the equimolar amount of insulin has negligible extraction by the liver and constant peripheral clearance making half life longer than insulin. For this reason it is commonly used in preference to insulin measurement when assessing B cell function in clinical practice. [15]

Maturity-onset diabetes of the young (MODY) is a rarer, genetic form of diabetes, which can be misdiagnosed as T1DM. [16] C-peptide has been proposed as a useful biomarker in the detection of MODY prior to genetic testing. In MODY, whilst there is reduction in beta cell function, some insulin secretion is retained compared to T1DM. UCPCR has been used as a tool to discriminate between two of the most common types of MODY: HNF1A and HNF4A heterozygous mutations, and long-duration T1DM. [17] UCPCR was found to be significantly lower in subjects with type 1 diabetes of greater than 5 years' duration, compared with subjects with HNF1A/4A MODY ($p < 0.0001$). The "Diabetes Diagnostics" app has been created by the University

of Exeter diabetes research team as a convenient resource for the diagnosis of MODY and other types of diabetes on the basis of clinical criteria according to national and international guidelines in addition to c-peptide interpretation. [18,19]

Conclusion

Insulin secretion estimated by measurement of Fasting C- Peptide was either normal or raised in newly diagnosed T2dm subjects in my study indicating predominant role of insulin resistance in the etiology.

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