e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2023; 15(10); 788-790

Original Research Article

To Investigate the Relationship between Fasting and Postprandial C-Peptide Levels and HbA1c in Individuals with Type 2 Diabetes Mellitus

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Received: 15-08-2023 / Revised: 16-09-2023 / Accepted: 28-10-2023
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Conflict of interest: Nil

Abstract

Aim: To investigate the relationship between fasting and postprandial C-peptide levels and HbA1c in individuals with Type 2 Diabetes mellitus.

Materials and Methods: This study was conducted in the Department of Biochemistry, Homi Bhabha Cancer Hospital (HBCH), Lahartara and Mahamana Pandit Madan Mohan Malaviya Cancer Centre (MPMMCC), Sundarbagiya, BHU Campus, Varanasi, Uttar Pradesh, India for 12 months. 50 patients were admitted. Serum samples 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: We took 50 patients who were T2DM then we did fasting C peptide & PP C-peptide and HbA1c. Out of 50, 15 were females &35 were males. Out of 50, 45 patients had raised HbA1C maximum around 8-10. Mean & SD for fasting C-Peptide for males was 1.346±1.070 & for females 2.442±2.57. Mean & SD for Post prandiol C-Peptide for males was 4.208±5.020 & for females 2.993±2.130. It was significant for fasting C- Peptide with P value 0.0371 and non significant for PP C peptide with p value 0.3731.

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 , postprandial, C-peptide, HbA1c, Type 2 Diabetes mellitus.

Introduction

Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder characterized by insulin resistance and a progressive decline in β-cell function, leading to hyperglycemia. The assessment of glycemic control is paramount in the management of T2DM, and HbA1c is the most commonly used marker for long-term glucose control. However, C-peptide levels, both fasting and postprandial (PP), provide crucial insights into endogenous insulin secretion and β-cell function, which are critical for understanding the pathophysiology and treatment response in T2DM. C-peptide, a byproduct of insulin biosynthesis, is co-secreted with insulin in equimolar amounts from pancreatic β-cells. [1-4] Unlike insulin, C-peptide is not significantly extracted by the liver, making it a more stable marker of endogenous insulin secretion. The measurement of fasting and PP C-peptide levels can offer a detailed view of β-cell activity and residual insulin secretion capacity in individuals with T2DM. Fasting C-peptide levels are often used to assess basal insulin secretion. Studies have shown that fasting C-peptide levels correlate with insulin resistance and the severity of β-cell dysfunction. [5-7] Higher fasting C-peptide levels are typically observed in individuals with significant insulin resistance, whereas lower levels suggest severe β-cell depletion. Postprandial C-peptide levels, measured after a meal or glucose load, reflect the β-cell's ability to respond to an increase in blood glucose. This dynamic measure is crucial for understanding the functional capacity of β-cells under physiologic conditions. Elevated PP C-peptide levels have been associated with better β-cell function and a lower risk of progression to insulin dependency. HbA1c remains the gold standard for long-term glycemic control, reflecting average blood glucose levels over approximately three months . The relationship between C-peptide levels and HbA1c provides insights into the balance between insulin secretion and insulin action. Several studies have indicated that higher C-peptide levels are associated with lower HbA1c, suggesting better β-cell function and glycemic control . Conversely, low C-peptide levels often correlate with higher

HbA1c values, indicating poor β-cell function and the need for intensified treatment . [8-11]

Materials and Methods

This study was conducted in the Department of Biochemistry, Homi Bhabha Cancer Hospital (HBCH), Lahartara and Mahamana Pandit Madan Mohan Malaviya Cancer Centre (MPMMCC), Sundarbagiya, BHU Campus, Varanasi, Uttar Pradesh, India for 12 months. 50 patients were admitted. Serum samples 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

We took 50 patients who were T2DM then we did fasting C peptide & PP C-peptide and HbA1c. Out of 50, 15 were females &35 were males. Out of 50, 45 patients had raised HbA1C maximum around 8-10. Mean & SD for fasting C-Peptide for males was 1.346±1.070 & for females 2.442±2.57. Mean & SD for Post prandiol C-Peptide for males was 4.208±5.020 & for females 2.993±2.130. It was significant for fasting C- Peptide with P value 0.0371 and non significant for PP C peptide with p value 0.3731.

Table 1:

Parameter	Male Mean±SD	Female Mean±SD	T value	P value	Significant
Fasting	1.346±1.070	2.442±2.573	2.144	0.0371	S(P≤0.05)
PP	4.208±5.020	2.993±2.130	0.8991	0.3731	NS(P≥0.05)

Table 2

Parameter	Male Mean±SD	Female Mean±SD	T value	P value	Significant
Fasting	1.346±1.070	2.442±2.573	2.144	0.0371	S(P≤0.05)
HbA1c	9.631±3.076	10.33±2.206	0.7948	0.4306	NS(P≥0.05)

Table 3:

Parameter	Male Mean±SD	Female Mean±SD	T value	P value	Significant
PP	4.208±5.020	2.993±2.130	0.8991	0.3731	NS(P≥0.05)
HbA1c	9.631±3.076	10.33±2.206	0.7948	0.4306	NS(P≥0.05)

Table 4:

Parameter	Raised Mean±SD	Unraised Mean±SD	T value	P value	Significant
Fasting	3.377±1.795	0.717±0.509	7.8927	0.0001	S(P≤0.05)
HbA1c	10.11±2.701	5.466±0.152	2.9492	0.0049	S(P≤0.05)

Discussion

T2DM is one of the leading cause of mortality and morbidity globally. While all ethnic groups are affected, the prevelance of T2DM in South Asians is extremely high and is continuing to rise rapidly. Though the South Asians share the basic pathophysiological defects of T2DM observed in ethnic groups there is strong evidence to suggest that South Asians are more insulin resistant than Caucasians with the onset of diabetes at younger ages with comparatively lower BMI. In Addition to an increased propensity for insulin resistance, South Asians may experience early decline in B cell function compared with other ethnic groups and an early impairment in B cell function cells also be a key pathophysiological mechanism in T2DM development in South Asians. [6] 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. [7] 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. [8-11]

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. Further research can explore the exact contribution of insulin resistance and insulin secretory defects in this area.

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