

Short Communication

C-peptide and cardiovascular system

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ABSTRACT

Background: C-peptide and insulin are secreted by pancreatic beta cells in equimolar concentrations. C- Peptide is associated with increased risk of cardiovascular disease.

Methods: Routine outpatient department patients were investigated for serum C-peptide, Diabetes, Ischemic heart disease, hypertension and skin lesion acanthosis negrican.

Results: Total ninety five patients enrolled in study of these peptide level 2, 2 to5 and >5 found in 22,46,27 patients respectively, with diabetes mellitus in 21 (95%), 39(55%) and 24 (89%), ischemic heart diseases 1(5%), 15(33%), 13(48%), hypertension 9(41%), 20(44%), 12(45%), acanthosis negrican 9 (41%), 27 (59%), 21 (78%), family history 1 (5%), 18 (39%), 11 (41%) respectively.

Conclusion: Significant incidence of hypertension and ischemic heart disease is related to raised level of circulating C-peptide.

Keywords: C-peptide, Hypertension, DM, Ischemic heart disease, Acanthosis negrican

INTRODUCTION

C-peptide and insulin are secreted by pancreatic beta cells in equimolar concentration. Diabetes mellitus, hypertension and ischemic heart disease are major health issues in developing country like India. Serum c-peptide no more considered being biologically inactive. It is one of biomarker for insulin resistant diabetes and risk factor for coronary artery disease.¹ Recent observations confirmed that it is active peptide carries important physiological functions.² Controversies regarding beneficial and pathological effects of C-peptide including improving microcirculation thereby improving nerve and renal function and C-peptide protein may be stored or deposited in the vessel wall and help for progression of atherosclerosis.^{3,4} However it has been well established that serum c-peptide is a marker of insulin resistance and it is significantly elevated in metabolic syndrome.⁵ C-peptide levels better biomarker of cardiovascular-related fatality.⁶ We here report that C-peptide and

acanthosis negrican as an independent clinical biomarkers and risk factors for diabetes mellitus, hypertension and ischemic heart disease.

METHODS

Patient with history suggestive of hypertension, ischemic heart disease, diabetes mellitus and similar illness in family were clinically examined, studied and investigated for C-peptide levels.

Details of family history including sudden death in family due to myocardial infarction, hypertension and diabetes were analysed.

Accurate blood pressure examined by mercury sphygmomanometer in sitting position three reading at ten minute interval. Blood pressure systolic >130 and diastolic > 90 mm hg is taken as hypertension.

Ischemic heart disease: history of exertion chest pain, relieved by rest or sublingual nitro-glycerine, T waves of ST-T changes in resting electrocardiogram or positive stress test.

Diabetes- history of sudden reduction in weight, polyphasia, polyuria, recurrent urinary tract infection, balanoprositis and virginitis (itching around vagina or penis). Fasting blood sugar >110 Mg/dl and post prandial >140mg dl, Glycosylated haemoglobin (HbA1C) >6.5%.

Acanthosis negrican: for a velvety thick skin changes examined back of neck, axillae, inguinal region and other flexors region of body.

C- peptide: fasting patient blood was collected and sent to Mumbai in cold ice box for analysis of C-peptide level.

Total 95 patients were investigated in detail given in Table 1. Incidence of Ischemic heart diseases is significantly high (p-0.003) accompanied with raised level of C-peptide. Similarly acanthosis negrican correlate the raised level of C-peptide (p-0.008).

Table 1: Demographic features.

	C peptide		
Clinical	<2	>2 to 5	5
Total Patients	22	46	27
Age in years(Mean)	56(20-86)	46(19-80)	52(20-86)
Sex	M13F9	M37F9	M20F7
Weight	63(50-90)	75(40-102)	72(52-116)
DM	21(95%)	39(59%)	24(89%)
Family H/O DM	1(5%)	18(39%)	11(41%)
IHD	1(5%)	15(33%)	13(48%)
Hypertension	9(41%)	20(44%)	12(45%)
Acanthosis negrican	9(41%)	27(59%)	21(78%)

Table 2: Demographic features of ischemic heart diseases.

		C-peptide level					
Variables		Mean	Standard Deviation	Median	Percentile	Percentile	p-value
Gender	Male	4.8	4.1	3.6	2.5	5.7	0.499
	Female	4.2	3.1	2.8	1.9	5.4	
Family H_DM	No	4.5	4.1	3.3	1.9	5.0	0.140
	Yes	4.8	3.1	3.3	2.7	6.6	
DM	No	4.7	1.6	4.6	4.3	6.6	0.148
	Yes	4.6	4.0	2.9	2.1	5.5	
IHD	No	3.7	2.6	2.9	1.9	4.9	0.003
	Yes	6.7	5.1	4.3	2.8	9.8	
Hypertension	No	4.2	3.2	3.4	2.3	5.3	0.769
	Yes	5.1	4.5	2.9	2.4	7.7	
Acanthosis	No	4.0	4.1	2.6	1.8	4.5	0.008
	Yes	5.0	3.6	3.9	2.7	6.6	

As in Figure 1:

1. Male Y chromosome
2. Double chin
3. Baldness
4. Ear crease
5. Acanthosis nigrican
6. Weight 90 kg body mass index 34kg/m²
7. Fasting blood sugar 202mgdl (11.2mmol), post lunch 330 mg/dl (18.33Mmol, HbA1c 8%)
8. Fasting C-peptide 9.6ng(normal 0.90-7.1)
9. Low density lipoprotein cholesterol 155 (n 0-130)
10. Blood pressure 180/130mmhg
11. Serum uric acid 8.54(n 4-6)mg/dl
12. Serum vitamin D <8.1(normal 30-60) ng.
13. He works as a clerk in office (sedentary job)
14. Height 163 cm [180cm +-8] immune for ischaemic heart disease



Figure 1: Coronary risk factors or coronary strangulates.

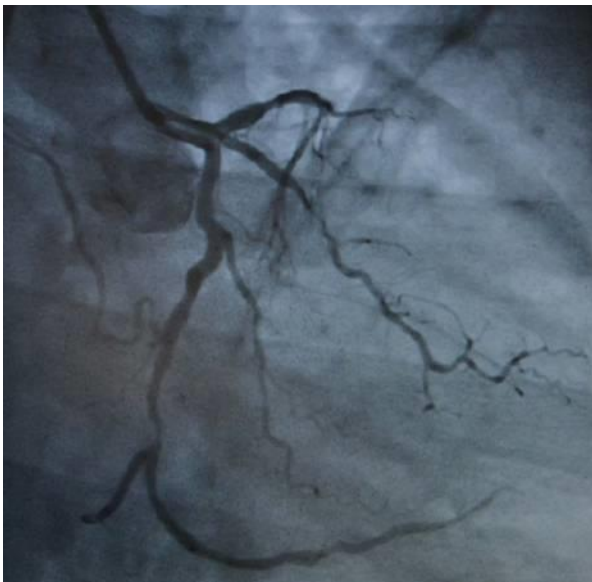


Figure 2: Coronary angiography showing diffuse coronary atherosclerosis.

DISCUSSION

We have shown that serum C-peptide is an independent risk factor for ischemic heart disease. Acanthosis nigricans a velvety skin manifestation is accompanied with raised circulating C-peptide and type 2 diabetes mellitus. It is dark, coarse thickened skin. Earliest change is gray-brown coloration with dryness and rough skin. Acanthosis nigricans are symmetrical located over back and sides of neck, axillae, groin and flexors areas of joints. At times lesion can be detected around the areolae, eyes and lips. Periocular distribution often seen insulin resistance diabetes. Over weight is common cause of acanthosis nigricans. Proper and correct dose of insulin

prevent the progress of acanthosis nigricans. Unintentional weight loss. Rapid progressive acanthosis nigricans, atypical site of acanthosis nigricans, thicker palms often seen in oesophageal malignancy. Re-appearance of acanthosis nigricans in a malignancy treated victim suggests recurrence or metastasis. Cardiac dysfunction usually occurred in an insulin resistant diabetes, is attributed to endothelial dysfunction. Weight loss and regular exercise have shown to raise the insulin sensitivity with reduction in circulating insulin level. Cardiovascular disease is the most common life threatening medical problem of Indian population. Controversies regarding c-peptide beneficial or responsible for cardiovascular system exist. It has been shown that a small level of remaining c-peptide is associated with significant metabolic benefit. C-peptide is effective for whole body glucose utilization, fat tissue metabolism, and tissues blood flow.⁷

Serum C-peptide is recognized as an indicator of insulin resistance and biological marker of beta cell function. It is an active peptide involved in important physiological functions. It affects micro vascular blood flow and improves nerve and renal function in a type -1 diabetes. In other studies suggested that serum c-peptide may be deposited in the vessel wall during early atherogenesis and evokes inflammation. C-peptide is marker for impending stroke in insulin resistant diabetes. C-peptide is an independent risk factor for cardiovascular disease related mortality in non-diabetics.

C-Peptide was shown to affect micro vascular blood flow and to improve the nerve and renal function in human type-1 diabetes mellitus.³ Other studies shown that serum c-peptide may be deposited and stored in vessel wall during early parthenogenesis and promote inflammation.⁴ In present report incidence of ischemic heart disease is significant with raised level of serum c-peptide ($p<003$). Thus c-peptide is an independent risk factor for cardiovascular system. Hyperinsulinemia accompanied with raised serum C-peptide responsible for premature atherosclerosis. Amount NO released by endothelial cell depends upon the c-peptide stimulus.⁸ Severity of diabetic symptoms depend upon the serum insulin and c-peptide level.⁹

Acanthosis nigricans a marker of insulin resistant, with raised C-peptide level, obesity, and polycystic ovarian syndrome. Hyperinsulinaemia activates insulin like growth factor-I receptor result in the proliferation of keratinocytes and fibroblasts manifest acanthosis.¹⁰ Thus skin, a mirror reflecting diabetes mellitus, and ischemic heart diseases, hypertension, myocardial infraction have elevated concentration of C-peptide contributes to increased cardiovascular risk in these patients.¹¹

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