Estimation of Parameters (Serum Glucose, Urea, Creatinine And C-Peptide) in Diabetic Nephropathy

Rukia A. Jassim[1] , Zeena A. Alsaady[2]

[1]High Diploma, College of Medicine Al Nahrain University, Iraq,
[2]Ph.D., College of Medicine Al Nahrain University, Iraq

Abstract

Diabetes mellitus is a metabolic disorder of multiple aetiology. Destruction of pancreatic beta cells, hyperglycaemia, and insulin deficiency cause type 1 diabetes mellitus. Diabetic nephropathy is the damage to kidneys because of diabetes. It is predominantly seen in patients with type 1 diabetes (insulin-dependent type) and type 2 diabetes (non-insulin-dependent type). An active peptide hormone, C-peptide has the likelihood of causing major physiological effects. C-peptide is the best indication of endogenous insulin secretion occurring in patients with diabetes. In this regard, the current study undertakes a comprehensive study of C-peptide and kidney (renal) failure in patients with diabetes mellitus type 1 , in order to assess their association . The subjects for this study were (70) patients with type 1 DM and (65) patients with diabetic nephropathy in different age and both sex , Laboratory tests such as (serum creatinine, urea, glucose, albumin , total protein and fasting serum C-peptide, are conducted. Data was compare the values between different category patients.

Keywords: *parameters, Estimation, diabetic nephropathy.*

Introduction

Diabetes mellitus

is a metabolic disorder of multiple aetiology [1] destruction of pancreatic beta cells , and insulin deficiency cause type 1, diabetes mellitus can cause long –term damage which includes dysfunction or failure of various organ

Diabetic nephropathy (DN)

also know **as (diabetic kidney disease) is** the chronic loss of kidney function occurring in those with diabetes mellitus [1] , protein loss in the urine due to damage to the glomeruli may become massive and cause a low serum with resulting generalized body swelling (edema) and result in the nephrotic syndrome (Medline Plus Medical Encyclopedia (2015) likewise , the estimated glomerular filtration rate (eGFR) may progressively fall from a normal of over 90 ml/min/1.73 m2 to less than 15 , at which point the patient have end stage kidney disease (ESKD) it usually is slowly progressive over year .

C-peptide as a marker for diabetic nephropathy

The connecting peptide, or c-peptide is a short (31- amino-acide polypeptide) that connects A- chain its B- C-chain in the proinsulin molecule, in the insulin synthesis pathway , first preproinsulin is translocated into the endoplasmic reticulum of beta cells of the pancreas with an A-chain , a C-peptide , a B-chain , and a signal sequence , the signal sequence is cleaved from the N-terminus of the peptide by a signal peptidase , leaving proinsulin after proinsulin is packaged into vesicles in the Golgi apparatus (beta-granules) the C-peptide is removed, leaving the A-chain and B-chain bound together by disulfide bonds that constitute the insulin molecule [2-4] an active peptide hormone , c-peptide has the likelihood of causing major physiological effects , C-peptide and insulin are produced in equal amounts , it has the capacity to weaken glomerular hyperfiltration and bring down urinary albumin excretion in experimental as well as human type 1 diabetes [5-7].

C-peptide is the best indication of endogenous insulin secretion occurring in patients with diabetes , the amount of C-peptide in the blood indicates the amount of insulin produced by the pancreas , blood sugar level in the body is not affected by C-peptide , the purpose of performing C-peptide test done after the initial diagnosis of DM , is to ascertain whether it is type 1 or type 2

diabetes , in the individual whose pancreas does not produce insulin (type 1 diabetes) has a reduced level of insulin and C-peptide, determination of C-peptide levels is preferred to determination of insulin levels as insulin concentration in the portal veins is (2-10)times greater than in the peripheral circulation. [8] about half the amount of insulin that reaches liver plasma, is observed by the liver , however , this varies with the nutritional state , in type 1 DM there is a reduced level of insulin production by the pancreas ,and in this case ,the patients will also have a reduced level of C-peptide, whereas in type 2 DM the C-peptide levels in patients are more t the normal levels.

Materials and Methods

This study was performed in (The Iraqi center of dialysis). The present study was carried out to evaluate some chemicals in sera collected of (54) Iraqi patients affected with renal failure and type-1 Diabetic Mellitus involved both sexes with age between (20 — 40) years. In addition to (54) case healthy control. Most of patients were of age group between (20_ 40) years. Laboratory tests were performed, using enzymatic methods for (Blood glucose ,urea , creatinine and C-peptide)

Results

Comparsion of baseline characteristics among different categories of patients C-peptide level

In the table (1) A &B showed distribution of C-peptide levels with (70) diabeties and(65) diabetic nephropathy with different age and both sex

Table 1: Distribution of C-peptide levels between diabetics and diabetic nephropathy patients

characteristics	C-pepttide			P. value
	<0.5 low	(0.5 – 2.0) normal	>2.1 Elevated	
D.M nephropathy	35 (58.3%)	15 (27.3%)	15 (75.0%)	0.000
D.M	25 (41.7%)	40 (72.7%)	5 (25%)	
Age	38.92 (± 3,01)	30.36 (± 2,31)	35.50(±4.95)	0.093
Male	30 (50.0%)	20 (36.4%)	0 (0.0%)	0.000
Female	30 (50.0%)	35 (63.6%)	20 (100%)	
R.B.S	203,25 (±4,26)	205,91 (±2,31)	206.75 (±7.18)	0.827
HbA1c	8,08 (± 0.17)	10,95 (±2.02)	6.75 (±0.27)	0.149
Urea	59,33 (±2.95)	52,45 (±3.04)	62.25 (±5.28)	0.149
Creatinine	3.28 (± 0.28)	2,03 (± 0.22)	3.47 (± 0.42)	0.001
Albumin	5,60 (± 0.14)	4,73 (± 0.13)	5.57 (± 0.18)	0.000
Total protein	(± 0.16)8.16	6.97 (± 0.15)	8.20 (± 0.26)	0.000

Table 2: Correlation of serum C-peptide level with other parameters

C-pepttide	Correlation coefficient (r values)	P. value
R.B.S	0.095	0.272
HbA1c	-0.061	0.481
Urea	0.069	0.427
Creatinine	0.020	0.815
Albumin	-0.062	0.477
Total protein	-0.065	0.453

Table 3: Demographic characteristics of the patients

characteristics	Mean
D.M nephropathy	65(48.1%)
D.M	70 (51.9%)
Age	34.93(± 1.814)
Male	50 (37%)
Female	85 (63%)
R.B.S	204.85(± 2.35)
HbA1c	9.056 (± 0.83)
Urea	56.96 (± 1.98)
Creatinine	2.80 (± 0.17)
Albumin	5.24 (± 0.09)
Total protein	7.68 (± 0.11)

Discussions

The following tables and figures involved the results for many parameters :-

(1)C-peptide:- determination of serum C-peptide levels can be considered in diabetes clinical practice for patients under insulin treatment , C-peptide measurement is particularly useful when there is uncertainty about the treatment (**Kitabchi AE (1977)** With the discovery of the method of insulin biosynthesis, many initial studies focused on the possible physiological effects of C-peptide .Efforts to find insulin-like effects on blood glucose levels .glucose disposal after glucose loading were in vain .

(2) In the recent times, new data that have been presented confirms a specific binding of C-peptide cells to cell surfaces that indicate G-protein coupled membrane receptors. Therefore, it can be stated that C-peptide can induce certain intracellular processes and thereby influence nerve and renal function in C-peptide deficient type diabetes patients . With the increasingly common clinical context, C-peptide can be highly useful in disease classification and in providing appropriate treatment The current **(Jones AG , Hattersley AT (2013**) in **table (1)A** note that C-peptide levels was normal (category 1) in (55) patients among them (20) male (36.4%) and (35) female (63.6%) , C-peptide was elevated (category 2) in 20 patients from female only , C-peptide below normal (category 3) 60 patients 30 male (50.0%) and 30 female (50.0%) and high levels of suger (206.75 ± 7.18) was P value (0.827) and high levels for each (blood urea (62.25± 5.28) ,creatinine (3.47 ± 0.42) ,albumin (5.57 ± 0.18) and total protein 8.20 ± 0.26)

(3) In this study show the prevalence of diabetes was 63% higher among females than males . Differences in lifestyle, tradition and culture were presumed to be the possible reasons for higher prevalence of obesity and diabetes among female. comparison of baseline characteristics among different categories note low C-peptide in patients with diabetes but high in diabetics nephropathy this result from hypersecretion of B-cells ,a decreased degradation or secreation . **(5)** note hyperglycemia in patients with diabetic nephropathy (217.69± 3.55) more than patients with diabetes (129.93± 2.36) and high level for each blood urea (78.38± 1.68) ,creatinine (4.72 ± 0.15) , albumin (6.22 ± 0.074) and total protein (8.91 ± 0.06)

(6) note the low of (c-peptide) in the diabetic of high type which is used to know the amont of insulin Secreted from the body where it is produced equally to produce normal insulin from the pancreas and is not affected by any external insulin. Low (c.peptide)level relationship with low produce insulin hormone and can this happin when not produce enough from insulin by B.cell in case diabetic mellitus . In addition allows us to determine what is the pancreatic reserve a mount, ie how much insulin the pancreas is still able to secrete in diabetic. It helps to determine the type of diabetes that the patient is concerned with. When the peptide levels are low and the body does not produce insulin, the diagnosis is almost certain for type 1 diabetes and bete cells are almost destructire

Each kidney is made up of hundreds of thousands of small units called Nevron, which units task to carry out blood fittering and remore harmful chemicals from the body control of fluid balance in the body and people with diabetes slowly changes the composition of the unit of nephrons, especially the thickening of its components and show small scars of fibrous tissue over time and then start nephrons in the leakage of albumin protein in the blood to get out with urine.

Conclusion

1-In early stages of renal failure, insulin secretion and resistance in peripheral tissues, primarily in skeletal muscle, is reduced.

2- in advanced stages of renal failure, renal clearance is reduced.

3- These facts are clinically important in the treatment of diabetes,

Although insulin resistance increases the insulin requirement.

4- decreased insulin degradation reduces the need for administration of insulin in diabetic patients with advanced **corticotrophin-releasing factor** , which increases the risk of hypoglycemia.

5- Severe hyperglycemia in oliguric or anuric ESRD patients is not associated with features of osmotic diuresis, which is seen in patients without renal failure, but it can cause hyponatremia, hyperkalemia, and acute increase in the intravascular volume.

6-In several large studies on ESRD patients, there was no correlation between increased survival and tight blood glucose control of patients.

7- It is suggested that the incidence of hypoglycemia was significantly higher in patients receiving strict glycemic control.

8- It is recommended that blood sugar control be considered an important goal in the treatment of ESRD diabetic patients to prevent additional damage to other organs including the eyes, kidneys, and heart

Recommendations

1-adjust the blood sugar level and maintain its natural rates because the high level of suger for a long time causes rough internal internal wall for arteries this causes platelet deposition, which can lead to a mild stroke. When these clots grow, they close the aeteries and hinder blood from reaching the tissues leading to impaired kidney .

2- analyze every three months with the periodic follow-up with the specialist doctor to ensure that there are no complications .

3-adjust the blood pressure especially if they are accompanied by a diabetes .

4- the work of the urine analysis and kidney functions periodically .

5- physical exercise in the case of uncontrolled blood sugar level .

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Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved and all experiments were carried out in accordance with approved guidelines.

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