Original Article ISSN (O):2395-2822; ISSN (P):2395-2814

Assessment of C Peptide & Insulin Levels in Diabetic Patients on Renal Dialysis

Debasis Debadatta Behera[1]

[1]Assistant professor, Department of Biochemistry, Hi-Tech Medical College & Hospital, Bhubaneswar, Odisha, India.

Received: June 2018
Accepted: June 2018

ABSTRACT

Background: This study was designed for assessment of C peptide & insulin levels in diabetic patients on renal dialysis. **Methods:** We conducted the study on twenty eight patients diagnosed with diabetic chronic kidney disease and undergoing regular renal dialysis in the Nephrology Department, Hi-Tech Medical College & Hospital, Bhubaneswar. They were studied for following laboratory investigations like Random blood glucose, fasting serum C peptide, HbA1C, Insulin, serum creatinine, blood urea and urine albumin. **Results:** Blood sugar, blood urea, serum creatinine & urinary albumin values were found to be higher in the predialysis than in the postdialysis, these values were found to be statistically Significant at p value <0.05. Statistically significant, mean insulin and c peptide values were found to be higher in the predialysis than in the postdialysis (p≤0.011, p≤0.016; respectively). **Conclusion:** We observed that insulin and c-peptide levels were decreased in post dialysis samples as compared to pre dialysis samples in diabetic patients.

Keywords: Diabetic kidney patients, renal dialysis, C peptide and Insulin.

INTRODUCTION

In the ancient Sanskrit Literature, diabetes mellitus was described as "honey-urine disease," associated with gross emaciation and wasting. Diabetes is a global endemic with rapidly increasing prevalence in both developing and developed countries.[1] In Indian population, 61.3 million people had diabetes in 2011, which is expected to reach 101.2 million by 2030 (International Diabetes Federation) now placing India at second position in world diabetic prevalence.[2]

C peptide is a polypeptide with a molecular weight of 3600, containing 31 amino acids. In insulin bio-synthesis, C-peptide is cleaved from pro-insulin, stored in secretory granules, and eventually released into the bloodstream in amounts equimolar with those of insulin. C-peptide has an essential function in the synthesis of insulin in that it links the A and B chains in a manner that allows correct folding and inter-chain disulfide bond formation.[3] The kidney has been suggested as the main organ for the degradation of C-peptide. Half-life of C peptide in circulation is 2–5 times longer than insulin.[4]

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). It is also seen in patients showing secondary forms of diabetes mellitus (DM) following pancreatitis when the duration of DM is sufficiently long and when the glycaemia is upto the level that can result in diabetic complications.[5,6] Nearly 20% to 30% of patients who have type 1 DM have been found to have microalbuminuria after an average period of diabetes of 15 years. Almost half the number of these patients will gradually develop macroalbuminuria which is otherwise known as overt nephropathy.[5,7] Overt nephropathy, in a significant number of patients progresses and eventually results in end-stage renal disease (ESRD) with reported rates of 4% to 17% at 20 years and around 16% at 30 years from the first diagnosis of diabetes mellitus. Plasma insulin and c-peptide are cleared during haemodialysis. Their clearance rate and reduction rates depends on type of dialysis membrane and patients following diabetic medications. Our aim was for assessment of C peptide & insulin levels in diabetic patients on renal dialysis.

Name & Address of Corresponding Author
Dr. Debasis Debadatta Behera,
Assistant professor,
Department of Biochemistry,
Hi-Tech Medical College & Hospital,
Bhubaneswar, Odisha, India.

MATERIALS AND METHODS

The present study was conducted in the Department of Biochemistry, Hi-Tech Medical College & Hospital Bhubaneshwar, Odisha, India, during the period from February 2016 to October 2016 in collaboration with the department of Nephrology. The study protocol was approved by the Ethics

committee of Hi-Tech Medical College & Hospital Bhubaneshwar. 28 patients diagnosed with diabetic chronic kidney disease and undergoing regular renal dialysis in the Nephrology Department, HMCH were studied for following laboratory investigations including Random blood glucose, fasting serum C peptide, HbA1C, Insulin, serum creatinine, blood urea and urine albumin. All the values were expressed as mean ± SD. We used student t-test and pearson's correlation coefficient to find the statistical significance. A P-value <0.05 was to be considered statistically significant.

RESULTS & DISCUSSION

A total of twenty eight diabetic patients were included in the study, 18 males (64.28%) and 10 females (35.71%). The mean age of the patients was 46.24 years. Table 1 shows the levels of biochemical parameters in diabetic patients on regular haemodialysis (predialysis and postdialysis). [Table 1] shows the mean of diabetic patients on regular haemodialysis with biochemical parameters: blood sugar, blood urea, serum creatinine & urinary albumin values were found to be higher in the predialysis than in the postdialysis, these values were found to be statistically Significant at p value <0.05. Statistically significant, mean insulin and c peptide values were found to be higher in the predialysis than in the postdialysis ($p \leq 0.011$, $p \leq 0.016$; respectively).

Table 1: Concentration of biochemical parameters in diabetic patients on regular haemodialysis (predialysis and postdialysis)

Biochemical Parameters	Predialysis (Mean±SD)	Postdialysis (Mean±SD)
Blood Sugar Random (mg/dl)	154.06±16.5	128.2±14.7
C peptide (ng/dl)	4.9±2.04	3.2±1.6
Insulin (µIU/ml)	14.21±6.2	9.6±6.02
Blood urea (mg/dl)	165.0±22.5	72.02±8.4
Serum creatinine (mg/dl)	8.05±2.04	2.9±0.42
Urinary albumin (mg/L)	2.8±0.62	2.02±0.51

(Note:*Statistically Significant at p value <0.05)

Insulin resistance is one of the most important of metabolic syndrome, causing an increase in the oxidative stress and release of many proinflammatory cytokines. Thus, it plays a role in development of atherosclerosis and increasing the risk for cardiovascular disease. Therefore, insulin resistance contributes to the development of cardiovascular diseases that are the most important cause of morbidity and mortality in chronic kidney disease and in patients receiving dialysis replacement therapy.[8,9]

It has been shown in uremic patients that, glucose uptake decreased in the extrahepatic tissues and insulin resistance essentially developed in the peripheral tissues.[10,11] In addition; many factors including age, BMI, hypertension and dyslipidemia have effects on the development of insulin resistance. It was established by Abe et al that polysulphone membranes has high insulin clearance.[12] He also inferred that adsorption of insulin to filters was the cause of removal as no insulin was revealed in the utilized dialysate. On the contrary, Morten B Jorgensen et al detected the presence of insulin in all dialysate samples.[13] This disparity in results can be explained by either permeability of dialyzer membrane and matrix interference or relative slow blood flow. Moreover, the capacity of proteins to adsorb is determined by hydrophilic/ hydrophobic and electrochemical properties, which in turn is influenced by the composition of membranes (polysulphone, polyvidone and polyamide polymers). Evaluation of the variations in the clearance of insulin and c-peptide of diabetic patients on hemodialysis in relation to the glycemic control of diabetes is considered important to understand the effect of dialysis on the glycemic status.

This present study we observed that insulin and c-peptide levels were decreased in post dialysis samples as compared to pre dialysis samples in diabetic patients. Various authors observed that dialysis would interfere with glucose homeostasis and good glycemic control results in better survival of ESRD.[14,15] The high variability in the clearance of insulin and c-peptide in the controlled and uncontrolled diabetic groups could be attributed to the flow rate of blood through the dialysis membrane.

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. 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.

CONCLUSION

These findings suggest that, the alterations in the glycemic status, insulin and c-peptide levels have been observed in patients undergoing haemodialysis. We observed that insulin and c-peptide levels were decreased in post dialysis samples as compared to pre dialysis samples in diabetic patients.

REFERENCES

1. MK Yadav, TK Mohapatra, RK Mohapatra, et al. Study on Glycated Hemoglobin & lipid profile in Type-2 Diabetes Mellitus. International Journal of Science & Research (IJSR) , June 2015; 4(6):1917-19.

2. Anjana RM, Pradeepa R, Deepa M, et al Prevalence of diabetes and prediabetes (impaired fasting glucose and/or impaired glucose tolerance) in urban and rural india: phase I results of the Indian Council of Medical Research- Indian Diabetes (ICMR-INDIAB) study: Diabetologia 2011; 54(12): 3022-7.
3. Kitabchi A. Proinsulin and C-peptide. Metabolism. 1977;26:547–87.
4. Regeur L, Faber OK, Binder C. Plasma C-peptide in uraemic patients. Scand J Clin Lab Invest. 1978;38:771–5.
5. Ritz E, Orth SR (1999) Nephropathy in patients with type 2 diabetes mellitus. N Engl J Med 341: 1127-1133.
6. Krolewski M, Eggers PW, Warram JH (1996) Magnitude of end-stage renal disease in IDDM: A 35 year follow-up study. Kidney Int 50: 2041-2046.
7. Brenner BM, Cooper ME, Zeeuw DD, Keane WF, Mitch WE, et al. (2001) Effects of losartan on renal and cardiovascular outcomes in patients with type 2 diabetes and nephropathy. N Engl J Med 345: 861-869.
8. Paneni F, Costantino S, Cosentino F. Insulin resistance, diabetes, and cardiovascular risk. Curr Atheroscler Rep. 2014;16(7): 414–419.
9. Caravaca F, Cerezo I, Macı´as R, et al. Insulin resistance in chronic kidney disease: Its clinical characteristics and prognosis significance. Nefrologia. 2010;30(6):661–668.
10. Hage Hassan R, Bourron O, Hajduch E. Defect of insulin signal in peripheral tissues: Important role of ceramide. World J Diabetes. 2014;5(3):244–257.
11. Benito M. Tissue-specificity of insulin action and resistance. Arch Physiol Biochem. 2011;117(3):96–104.
12. Abe M, Kaizu K, Matsumoto K. Plasma insulin is removed by hemodialysis: evaluation of the relation between plasma insulin and glucose by using a dialysate with or without glucose. Ther Apher Dial. 2007;11:280-7.
13. Jorgensen MB, Idorn T, Knop FK, Holst JJ, Hornum M. Feldt-Rasmussen B. Clearance of glucoregulatory peptide hormones during haemodialysis in non-diabetic end-stage renal disease patients. Nephrology Dialysis Transplantation. 2015;30(3):513-20.
14. Park J, Lertdumrongluk P, Molnar MZ, Kovesdy CP, Kalnta-Zadeh K. Glycemic control in diabetic dialysis patients and the burn-out diabetes phenomenon Current Diabetes Reports. 2012;12(4)432 -9.
15. Morioka T, Emoto M, Tabata T, Shoji T, Tahara H, Kishimoto H, et al. Glycemic control is a predictor of survival for diabetic patients on dialysis. Diabetes Care. 2001;24(5):909-13.

How to cite this article: Behera DD. Assessment of C Peptide & Insulin Levels in Diabetic Patients on Renal Dialysis. Ann. Int. Med. Den. Res. 2018; 4(4):BC39-BC41.

Source of Support: Nil, **Conflict of Interest:** None declared