

Impact of Diabetes Mellitus on iPTH Levels in CKD Patients on Maintenance Hemodialysis

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Abstract: To study the impact of DM on iPTH levels in CKD patients undergoing maintenance hemodialysis. 44 Diabetic CKD patients and 56 Non-Diabetic CKD patients were studied. Fasting Plasma Glucose was measured by Hexokinase method and Serum iPTH levels were measured by Chemiluminescence immunoassay. The Mean of PTH in Diabetics is 239.6 pg/ml compared to the Mean of 306.7 pg/ml in Non-Diabetics. The decrease in PTH in Diabetics is highly significant ($p < 0.001$) when statistically analysed with Student *t*-test. This suppression of PTH secretion in Diabetics can be considered to be due to Hyperglycemia seen in DM, which causes inhibition of secretion of PTH by parathyroid cells. We conclude from our study that there is significant decrease in iPTH levels among Diabetic CKD patients on Maintenance Hemodialysis which is responsible for the development of Adynamic Bone Disease in these patients compared to Non-Diabetics. Careful management of Mineral Bone Disease in these patients is essential to avoid Low Turnover Bone Disease (LTBD).

Keywords: Chronic Kidney Disease, intact Parathormone, Diabetes Mellitus, Secondary Hyperparathyroidism, Chronic Kidney Disease-Mineral Bone Disorder

Date of Submission: 24-10-2019

Date of Acceptance: 09-11-2019

I. Introduction

Chronic kidney disease (CKD) is an important global public health problem^[1], affecting 5–10% of the world population^[2]. It has been noted in studies that Diabetes Mellitus is one of the leading cause of CKD^[3]. Diabetic Mellitus has now become a leading cause for CKD and alone accounts for about 40% of cases among CKD population in India. Poor metabolic control associated with DM can result in alterations of Calcium Homeostasis. Diabetic patients present with a lower level of Serum PTH, Calcium and Magnesium values than the non-diabetic population. Low PTH concentrations can result in decreased bone formation and weak bones which lead to a higher risk of vertebral fractures in diabetic patients^[4]. An excess of glucose or a deficit of Insulin, were independent and additive in their action on PTH^[5].

It was shown that in CKD patients undergoing Hemodialysis, DM conferred a protective effect from the skeletal complications of Secondary Hyperparathyroidism (SHPTH)^[6]. This was explained by the lower Serum iPTH seen among Diabetic Chronic Hemodialysis patients when compared to non-Diabetics. However, Renal Osteodystrophy (ROD) can result from suppression of rate of bone formation due to low Serum PTH levels in Diabetic Hemodialysed patients, and this manifests in the form of Low Turnover Bone Disease (LTBD). This low bone turnover can be associated with Low Bone Mineral Density, vascular calcifications, cardiovascular morbidity and overall high mortality, thereby overcoming any protective effect DM might have had in CKD^[7].

II. Material And Methods

This was a prospective observational study of patients attending the Nephroplus, at Government General Hospital, Guntur for a duration of six months with the approval of the Institutional Ethical committee. 44 cases of Diabetic CKD patients and 56 controls of Non-Diabetic CKD patients undergoing Maintenance Hemodialysis.

Inclusion Criteria:

1. CKD patients irrespective of the cause
2. Undergoing Hemodialysis for more than 3 months

Exclusion Criteria:

Patients with Primary Hyperparathyroidism

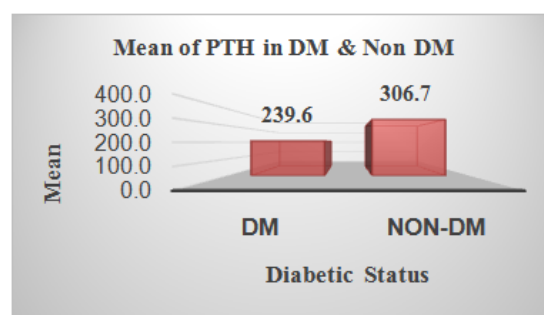
Methodology: Fasting Plasma Glucose was measured by Hexokinase method in BC AU480 and Serum iPTH levels were measured by Chemiluminescence immunoassay in BC Access 2.

III. Results

SPSS V22 software was used for statistical analysis. Microsoft Excel (windows-7) was used for data entry and graphs. The data is presented as mean \pm SD & Student t-test was employed to test the relation between Diabetic and Non-Diabetic groups.

Comparison of Mean of PTH among Diabetic and Non-Diabetics

| Group | PTH (pg/ml) | | | | |
|---|-------------|------|-------|-------|-------|
| | N | Min | Max | Mean | SD |
| DM | 44 | 10.8 | 806.2 | 239.6 | 235.4 |
| Non-DM | 56 | 6.9 | 689.5 | 306.7 | 110.1 |
| Test applied: Student t-test, $p < 0.001$ | | | | | |



The Mean of PTH in Diabetics is 239.6pg/ml compared to the Mean of 306.7pg/ml in Non-Diabetics. The decrease in PTH in Diabetics is highly significant ($P < 0.001$).

IV. Discussion

Diabetes Mellitus being one of the leading causes of CKD has been constantly evaluated for its role in the development of CKD-MBD. Many hypotheses have been put forward to explain the relative hypoparathyroidism seen in diabetic chronic hemodialysis patients when compared to their non-diabetic counterparts. The suppression of PTH secretion can be considered to be due to Hyperglycemia seen in DM or the presence of Advanced Glycation End Products (AGE)^[8]. Sugimoto T et al., in their study, demonstrated that increasing the concentration of Glucose in the medium cultured bovine parathyroid cells caused inhibition of secretion of PTH by the cells^[5]. The results of our study correlate with the findings of Hamid Nasri^[9] study whose study showed significant differences of Serum Parathormone between Diabetic and Non-Diabetic Hemodialysis patients, with lower values in the diabetic group. In addition, another study by Guhet al.^[10], whose findings state that Diabetic Hemodialysis patients had lower PTH levels, correlates with the findings of this study.

V. Conclusion

Thus, it can be said that a relative Hypoparathyroidism is more prevalent among Diabetic Chronic Hemodialysis patients and it could manifest as Adynamic Bone Disease (ABD). Care should be taken while treating diabetic Chronic Hemodialysis patients with bone disease. Oral Calcium supplements, vitamin D supplements and increased Calcium in the dialysate should be avoided since they can lead to hypercalcemia. This can further suppress PTH secretion and result in aggravation of already existing LOW TURNOVER BONE DISEASE in such patients. Further studies using bone biopsy are required to establish that Diabetes Mellitus can cause Adynamic Bone Disease in Chronic Hemodialysis patients.

References

- [1]. Levey, A. S., Atkins, R., Coresh, J., et al. (2007). Chronic kidney disease as a global public health problem: approaches and initiatives—a position statement from Kidney Disease Improving Global Outcomes. *Kidney Int*, 72, 247–59.
- [2]. Eknayan G, Lameire N, Barsoum R et al. The burden of kidney disease: improving global outcomes. *Kidney Int* 2004; 66: 1310–1314.
- [3]. Agarwal SK. Chronic Kidney Disease and its prevention in India. *Kidney Int*. 2005;68 (Suppl 98):S41-S45.
- [4]. Yamamoto M, Yamaguchi T, Nawata K, Yamauchi M, Sugimoto T, H. PT. Decreased Accompanied by Low Bone Formation Are Associated with Vertebral Fractures in Postmenopausal Women with Type 2 Diabetes. *The Journal of Clinical Endocrinology Metabolism*. 2012;97(4 SRC - BaiduScholar):1277-84.
- [5]. Sugimoto T, Ritter C, Morrissey J, Hayes C, Slatopolsky E. Effects of high concentrations of glucose on PTH secretion in parathyroid cells. *Kidney International*. 1990;37(6):1522-7.
- [6]. Inaba M, Nagasue K, Okuno S, Ueda M, Kumeda Y, Imanishi Y. Impaired secretion of parathyroid hormone, but not refractoriness of osteoblast, is a major mechanism of low bone turnover in hemodialyzed patients with diabetes mellitus. *American Journal of Kidney Diseases*. 2002;39(6 SRC - BaiduScholar):1261-9.

- [7]. Avram M, Mittman N, Myint M, Fein P. Importance of low serum intact parathyroid hormone as a predictor of mortality in hemodialysis and peritoneal dialysis patients: 14 years of prospective observation. *American Journal of Kidney Diseases*. 2001;38(6 SRC - BaiduScholar):1351-7.
- [8]. Dan S, Aditya P, Samanta M, Jothimalar R, Soundarajan P. Effect of glycemic control on intact parathyroid hormone level in end stage renal disease patients on maintenance hemodialysis. *Diabetes Research and Clinical Practice*. 2014;105(3):352-5.
- [9]. Hamid N. Impact of diabetes mellitus on parathyroid hormone in hemodialysis patients. *Journal of Parathyroid Disease*. 2013;1(1 SRC - BaiduScholar):9-11.
- [10]. Guh J, Chen H, Chuang H, Huang S, Chien L, Lai Y. Risk factors and risk for mortality of mild hypoparathyroidism in hemodialysis patients. *American Journal of Kidney Diseases*. 2002;39(6 SRC - BaiduScholar):1245-54.

Dr. P. Srinivasa Rao. "Impact of Diabetes Mellitus on iPTH Levels in CKD Patients on Maintenance Hemodialysis." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, vol. 18, no. 11, 2019, pp 14-16.