



STUDY OF SERUM CREATININE, SERUM UREA, ALBUMIN AND SERUM ELECTROLYTES IN T2DM AND HYPERTENSIVE PATIENTS IN JAIPUR

Medical Science

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ABSTRACT

Diabetic mellitus is a metabolic disorder and in India 69.2 million population are affected from T2DM. Complication of T2DM are hyperglycemia, diabetic nephropathy, diabetic retinopathy, etc. But due to Diabetic Nephropathy, Hypertension occur and also affect the population just as T2DM. Out of total death due to hypertension 57% death are due to stroke and 24% death from Coronary Heart Disease. According to WHO, 32.5% population are affected from hypertension and its still raises and only 25.6% patients have control BP. The level of serum creatinine, serum urea and albumin raises in both the condition whereas serum sodium raises in hypertension and its decline in case of Diabetic Mellitus type 2. The aim of the present study to estimate the level of serum creatinine, serum urea, albumin and serum electrolytes i.e., serum sodium and serum potassium and correlate them with T2DM and Hypertensive patients. Estimation of Serum Glucose for Random Blood Sugar was done by Glucose Oxidase and Peroxidase Method. Similarly, serum creatinine was estimated by Alkaline Jaffe's Picrate Method and serum urea was estimated by Berthelot's Method. Bromocresol Green (BCG) method was used for the estimation of Albumin. Also, estimation of Plasma Sodium and Plasma Potassium were by Ion Selective Electrode technique. The Mean $\pm$ SD, r value and p-value of serum creatinine, serum urea, albumin, serum sodium and serum potassium in T2DM are 0.87 ± 0.16 mg/dl ($r = -0.80$ and significant), 38.82 ± 16.32 mg/dl ($r = -0.46$, significant), 3.98 ± 0.215 g/dl ($r = 0.38$ and non significant), 145.8 ± 7.21 mmol/L ($r = 0.24$ and non significant) and 5.09 ± 1.06 mmol/L ($r = 0.33$ and non significant) respectively whereas the values in Hypertension are 8.14 ± 7.78 mg/dl ($r = 0.91$ and significant) for serum creatinine, for serum urea 245.84 ± 160.65 mg/dl ($r = 0.75$, significant), in case of albumin 3.76 ± 0.49 g/dl ($r = 0.19$ and non significant), 148.4 ± 7.9 mmol/L ($r = 0.026$ and non significant) for serum sodium and in serum potassium the values are 6.02 ± 2.56 mmol/L ($r = 0.33$ and significant). The level of serum creatinine and serum urea in T2DM and hypertension are raised whereas albumin are in normal range. Level of Serum sodium in T2DM and hypertension are remain unchanged. But in case of Serum Potassium it's raised in hypertension. Serum creatinine, Serum urea are the marker both for T2DM and Hypertension. The study help to detect and diagnose hypertension and diabetic mellitus type 2.

KEYWORDS

Serum Creatinine, Serum Urea, Albumin, Serum Sodium, Serum Potassium, T2DM, Hypertension

INTRODUCTION:

Diabetic Mellitus is a metabolic disorder which cover the world like an eclipse among it, Diabetic Mellitus type 2 is most common one. India with 69.2 million people with T2DM, is the second highest country after China.¹ T2DM is characterized by hyperglycemia, insulin resistance, impaired insulin secretion and utility and β -cell failure. The complication of T2DM are Short term complication which includes hyperglycaemia and hyperosmolar hyperglycaemic nonketotic syndrome (HHS) and Long term complications which includes diabetic retinopathy, diabetic nephropathy, diabetic neuropathy and microvascular disorders. Not only Diabetic Mellitus affect the world population, Hypertension also include as common disease. HTN exerts a substantial public health status and healthcare system in India.² It directly responsible for stroke death (57%) and coronary heart disease (CHD) death (24%) in India.³ According to WHO in 2008, the prevalence of raised BP in Indians was 32.5%⁴ and only 25.6% of treated patients had control BP.⁵ The level of Serum Creatinine, Serum Urea, albumin raised T2DM and HTN and also the level of plasma sodium and potassium imbalance in T2DM and HTN condition which would lead to complication both in case of T2DM and HTN. So, the aim of our study is to estimate the level of serum creatinine, serum urea, albumin, plasma sodium and potassium in both Diabetic Mellitus type 2 and Hypertensive patients and also correlate the markers with T2DM and HTN patients.

MATERIALS AND METHODS:

The study was conducted from January 2020 to April 2020 in the Department of Biochemistry, National Institute of Medical College & Hospital, Jaipur. A total of 27 T2DM samples were analysed and alone with that, 27 Hypertensive samples were analysed during research period taken from OPD/IPD from Department of Medicine, National Institute of Medical College & Hospital, Jaipur. Serum Creatinine, Serum Urea, Albumin, Plasma Sodium and Plasma Potassium were the parameters for both diabetic and hypertensive patients. Estimation of Serum Glucose for Random Blood Sugar was done by Glucose Oxidase and Peroxidase Method.⁶ Similarly, serum creatinine was estimated by Alkaline Jaffe's Picrate Method⁷ and serum urea was estimated by Berthelot's Method. Bromocresol Green (BCG) method⁸ was used for the estimation of Albumin. Also, estimation of Plasma

Sodium and Plasma Potassium were by Ion Selective Electrode technique.⁹

OBSERVATIONS AND RESULTS:

Table 1: Mean $\pm$ SD Concentration of Serum Creatinine, Serum Urea, Albumin, Plasma Sodium And Plasma Potassium in Diabetic Mellitus Type 2 and Hypertensive Patients

S. No.	Disease	No. of Cases	Serum Creatinine (mg/dl)	Serum Urea (mg/dl)	Albumin (g/dl)	Plasma Sodium (mmol/L)	Plasma Potassium (mmol/L)
1.	Diabetic Mellitus Type 2	27	0.87 ± 0.16	38.82 ± 16.35	3.98 ± 0.215	145.08 ± 7.21	5.09 ± 1.06
2.	Hypertension	27	8.14 ± 7.78	245.84 ± 160.65	3.76 ± 0.49	148.4 ± 7.9	6.02 ± 2.54

The table 1 showed that the Mean $\pm$ SD for T2DM patients was 441.78 ± 111.27 mg/dl and that of Hypertensive patients was 160.30 ± 28.27 mmHg. A total of 27 patients from each group were included for the research. The Mean $\pm$ SD for T2DM and Hypertensive patients were 0.87 ± 0.16 mg/dl and 8.14 ± 7.78 mg/dl respectively. 38.82 ± 16.35 mg/dl and 245.84 ± 160.65 mg/dl were the Mean $\pm$ SD for Serum Urea for T2DM and Hypertensive patients respectively. In case of Albumin, the Mean $\pm$ SD for T2DM was 3.98 ± 0.215 g/dl for T2DM and for Hypertensive patients was 3.76 ± 0.49 g/dl. The level of Plasma Sodium and Plasma Potassium for T2DM patients were 145.08 ± 7.21 mmol/L and 148.4 ± 7.9 mmol/L respectively. And the level of plasma sodium for Hypertensive patients was 5.09 ± 1.06 mmol/L. And that of Plasma Potassium was 6.02 ± 2.54 mmol/L.

Table 2: Pearson's Coefficient Correlations (r) and p-values

S. No.		Serum Creatinine		Serum Urea		Albumin		Plasma Sodium		Plasma Potassium	
1.	Diabetic Mellitus Type 2	r	p	r	p	r	p	r	p	r	p
		-0.80	<0.001	-0.46	0.016	0.38	0.50	0.24	0.22	0.33	0.87

2.	Hypertension	0.91	<0.001	0.754	<0.0001	0.19	0.34	0.026	0.90	0.33	<0.0001
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In the above table, the value Pearson's coefficient correlation between TYDM and Serum Creatinine -0.80 (Strongly Negative) whereas its significant. The value of r for Hypertension was 0.91 (Strongly Positive Coefficient) and its also Significant as Serum Creatinine. The value of r in case of Serum Urea for T2DM and Hypertensive patients were -0.46 (Negative Coefficient) and 0.754 (Strongly Positive Coefficient) respectively and p-value for T2DM and Hypertensive patients were 0.016 (Significant) and <0.00001 (Significant) respectively. The value of r and p in case of Albumin for T2DM were 0.38 (positive correlation with weak variables) and 0.50 (non-significant) respectively. While in case of Hypertension, the value of r and p were 0.19 (positive correlation with weak variables) and 0.34 (non-significant) respectively. 0.24 (positive coefficient) and 0.026 (positive coefficient) were the value of Plasma Sodium for TYDM and Hypertension respectively. Also, both having non-significant values for Plasma Sodium. The value of r for Plasma Potassium in case of T2DM and Hypertension were 0.33 each (positive coefficient) but the value of p in case of T2DM was 0.87 (non-significant) and that for Hypertension was <0.00001 (significant).

DISCUSSION:

The Mean±SD value of serum creatinine and serum urea in diabetic mellitus type 2 conditions were 0.87±0.16 mg/dl and 38.82±16.35mg/dl respectively. And both were statically significant which indicate in T2DM, serum creatinine and serum urea both raised significantly, predictor and prognostic tests of renal failure in diabetic patients with some limitations. Similar study was conducted by Dr. Madhusudan Rao Sirivole MD and Sadvimani Eturi in 2017¹⁰ and found out that the level of serum creatinine and serum urea in diabetic patients were significant high. According to V Viswanath et al 2004,¹¹ the Serum albumin was significant lower in nephropathic syndrome but in our study we found that the serum albumin was non significant related to diabetic mellitus type2 cases. In case of serum electrolytes level with that of T2DM, Sharlin B. Christian et al in 2015¹² found out that serum potassium level increases and serum sodium level decreases. But our study resemble with the level of serum potassium is whereas the level of serum sodium remain in normal range which doesn't resemble with the study. In our study we found that the level of serum creatinine and serum urea were higher in hypertensive patients and one of the study conducted by Basant Joshi et al in 2016¹³ strongly resemble with our study. According to Qiuju Deng et al in 2018¹⁴, elevated serum albumin level was a significant predictor of incident hypertension in Chinese population but in our study we found that the level of albumin was in normal range and non significant in case of hypertension which doesn't resemble with our finding. In our study we found out that the level of plasma sodium higher in case of hypertension and level of plasma potassium was in normal range but according to Anand Kumar and S.D. Prasad in 2019¹⁵, the level of serum sodium increases and the level of serum potassium decreases, which indicate that it doesn't resemble with our study in case of plasma potassium.

CONCLUSION:

In the present study we concluded that the level of Serum creatinine raised both in hypertension and Diabetic mellitus type2. Serum urea raised in hypertension. The level of albumin remain in normal range in both conditions. Serum Sodium raised in both cases. But in case of serum potassium, the level increases in case of hypertension as compared with that of diabetic mellitus type2. The improper values of serum albumin and serum electrolytes suggest that patients are under medication in both the conditions. So, Serum Creatinine and Serum Urea are the common markers to diagnose T2DM and Hypertension. Present study would help to detect the diseases and help to prevent the conditions in right time.

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