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Assessment of *Creatine Phosphokinase*, Serum Creatinine and Estimated Glomerular Filtration Rate in Patients with Hypothyroidism on Pre and Post Treatment in a Tertiary Care Teaching Hospital

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ABSTRACT

Hypothyroidism is a common endocrine disorder resulting from deficiency of thyroid hormone or, more rarely, from their impaired activity at tissue level. This study was designed to estimate the *Creatine phosphokinase*, serum creatinine level and estimated glomerular filtration rate in hypothyroidism cases and to assess the correlation with T4 and TSH. This Study included 62 patients of hypothyroidism. There is a significant alteration in *Creatine kinase*, creatinine, and estimated GFR (eGFR) in hypothyroid patients which may be due to renal and muscular damage resulting in renal failure and myopathies. Our study adds to the existing knowledge, the importance of periodic assessment of renal parameters and *Creatine kinase* in hypothyroid patients and effect of hypothyroid treatment on these biochemical parameters.

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INTRODUCTION

Hypothyroidism is a clinical condition characterized by abnormally low thyroid hormone production. Primary hypothyroidism results when thyroid gland fails to produce adequate hormones. In secondary hypothyroidism the hypothalamic-pituitary–thyroid axis works inadequately.

Hypothyroidism is one of the most common endocrine disorders in India. It affects 2-15% of population worldwide and women are more commonly affected compared to men. Most common cause is iodine deficiency and another cause is autoimmune thyroid disease characterized by elevated anti-Thyroid Peroxidase antibody. Subclinical hypothyroidism is characterized by increased TSH and normal fT3, fT4 serum levels. Subclinical hypothyroidism affects virtually every tissue in the body. This includes slowing of physical and mental activity. Long standing hypothyroidism can cause reversible changes in the metabolic parameters such as increase in serum creatinine.

Thyroid dysfunction causes remarkable changes in glomerular and tubular functions and electrolyte and water homeostasis. Hypothyroidism is accompanied by a decrease in glomerular filtration, elevation of serum creatinine and alteration of the ability for water excretion.

In recent years studies have been conducted to establish a relationship of *Creatine phosphokinase* (CPK) levels in thyroid diseases. A majority of patients with hypothyroidism have been shown to have an increased serum CPK. Serum CK was first used as a diagnostic aid in progressive muscular dystrophy. It has since then become an important clinical marker for muscle damage. The serum CK levels in healthy individuals depend on age, race, lean body mass and physical activity. Musculoskeletal disorders often accompany thyroid dysfunction. In addition to well-known observation that musculoskeletal disorders are common in patients with hypothyroidism, they are also observed in thyrotoxicosis and level of CK is altered in both these conditions. Skeletal muscle is affected by hypothyroidism more profoundly in cases of overt hypothyroidism and less so when subclinical hypothyroidism is present. The aim of this study is to estimate and compare serum creatinine level, estimated GFR and CPK in hypothyroid patients on pre and post treatment and to correlate with TSH, fT4.

LITERATURE REVIEW

1. Mahantesh B. B. *et al.***; (2015)** conducted a study on "Evaluation of serum creatinine in subclinical hypothyroidism A case – control study". Objective of this study was designed to estimate the serum creatinine level in subclinical hypothyroidism cases and to assess the correlation of serum creatinine with fT3, fT4, TSH. This case control study comprises of 61 newly diagnosed subclinical hypothyroidism cases and 61 age and sex matched healthy controls, attending medicine outpatient department of HSK hospital and research center Bagalkot. Duration of the study was from January 2015 to July 2015. Patients with newly diagnosed hypothyroidism in the age group of 20 to 59 years of both gender were included. The results of the study show serum creatinine level were significantly elevated in subclinical hypothyroidism cases in comparison to controls. Creatinine showed significant positive correlation with TSH and negative correlation with fT3, fT4 levels.

2. Qahtan A. Rashead *et al.***; (2015)** conducted a study on' The effect of thyroid hormone on some biochemical factors of kidney' aim of this study was to study the correlation between renal function markers and thyroid hormones. This study included 95 patients (Fifty patients suffering from thyroid dysfunction and forty five subjects used as control group) were collected from patients attending AL- Hashemia Teaching Hospital at Babil during the period from September (2013) to February (2014). Their age range between (5-70) years. Subjects were examined for the following parameters Serum creatinine, Blood urea, Thyroid Stimulating Hormone (TSH), Tetraidothyronine (T4) and Triidothyronine (T3).The results showed that the most patients were in age group between (26 – 45) years. This study shows there was a positive correlation between serum creatinine and thyroid hormone while there was a negative correlation between blood urea and thyroid hormone.

3. Mohammed Ali Imtiaz *et al.***; (2015)** conducted a study on "Renal and muscular dysfunction in overt hypothyroidism" The aims of this study were to compare parameters of serum creatinine, creatinine clearance, eGFR and *serum creatine kinase* in patient with overt hypothyroidism. This Case-control study included twenty eight diagnosed cases of hypothyroidism in the department of Endocrinology, Medicine and Surgery of A J Institute of Medical Sciences & Research Centre, Mangaluru, of age group 15-75 years. Based on T3, T4, TSH levels, subjects were diagnosed as overt hypothyroid. Results were compared with age and sex matched twenty five euthyroid. Serum T3, T4 and TSH; Serum creatinine; Creatinine clearance; and *Serum creatine kinase* were estimated and analyzed. There is a

significant alteration in *creatine kinase*, creatinine, creatinine clearance and estimated GFR (eGFR) in hypothyroid patients. The result of the study shows that patients with hypothyroidism can gradually end up with renal dysfunction and myopathies.

4. Rashmi Ranka *et al.***; (2003)** conducted a study on 'Serum creatine phosphokinase in thyroid disorders'. Aim of this study is decreased serum levels of triiodothyronine (T3) and thyroxine (T4) in hypothyroid patients is well established and check there is any correlation of *creatine phosphokinase* (CPK) with hypothyroidism. Therefore a study of serum CPK and thyroid profile was carried out in thyroid diseases. The results show, in hypothyroid patients T3, T4 levels in serum were found to be lowered with an increased level of thyroid stimulating hormone (TSH) associated with marked rise in serum CPK level. In hyperthyroid patient's serum levels of T3, T4 were found to be increased with decrease in TSH with significant decrease in creatine phosphokinase level. *Serum creatine phosphokinase* levels thus show an inverse relation with serum T3, T4 levels.

5. Ahmad mooraki *et al.***; (2003)** conducted a study on 'Reversible acute renal failure associated with hypothyroidism: report of four cases with a brief review of literature' this shows four adult cases of acute renal failure associated with hypothyroidism. Initial serum creatinine levels ranged between 115 and 203 mmol/L (1.3 and 2.3 mg/dL), with creatinine clearances (CrCl) ranging between 0.58 and 0.97 mL/s (34.5 and 58 mL/min). After 6–12 weeks of treatment with levothyroxin, serum creatinine levels decreased to the range of 80 and 124 mmol/L (0.9 and 1.4 mg/dL) and Cr Cl increased to 0.74–1.64 mL/s (44–98 mL/min). therapy. All of their patients had increased creatine kinase (CK), ranging between 1000 and 2360 U/L (normal range, 22–165 U/L), which normalized after 6 weeks of levothyroxine.

CONCLUSION

Patients with hypothyroidism can gradually end up with renal dysfunction and myopathies. This can be prevented by monitoring thyroid hormones levels along with periodic assessment of renal parameters (creatinine and eGFR) and *creatine kinase* in hypothyroid patients. This may beneficial in reducing the morbidity of patients. So this review shows reversible changes of serum creatinine, *creatine phosphokinase* and estimated glomerular filtration rate in patients after control of hypothyroidism.

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