

Study of Biochemical Markers of Myopathy in Hypothyroid Patients

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ABSTRACT

Background: Hypothyroidism is one of the most common endocrine disorders in the world resulting from insufficient thyroid hormone secretions i.e. T3 and T4 and elevation in TSH hormone. Musculoskeletal dysfunctions are often observed in cases of hypothyroidism during any time in disease process resulting in myopathy. Also, hypothyroidism associated myopathy seems to affect renal function, however these relationships require further investigations and need to be confirmed in more patients. Aim-To investigate biochemical markers (serum ck-total and serum creatinine) of myopathy in hypothyroid patients. Objectives- To estimate serum creatine kinase(ck-total) and serum creatinine levels in hypothyroid patients and compare it with healthy controls. **Methods:** The present study was conducted on male & female patients (age group 20-50 years) diagnosed with hypothyroidism, attending the OPD and IPD of general medicine of Teerthanker Mahaveer Hospital. The study group was comprised in different age groups of 70 primary hypothyroid patients. **Results:** A significant increase in serum TSH and creatine kinase (ck-total) levels was observed in hypothyroid cases when compared with controls ($p < 0.001$). A statistically non-significant increase in serum creatinine is observed in hypothyroid cases when compared with that of controls ($p > 0.001$). **Conclusion:** The present study indicated that the hypothyroid patients should be assessed for serum ck-total, and serum creatinine levels, which may lead to better treatment, prognosis of the disease. Moreover, early detection and routine screening of these parameters can prevent or relieve the symptoms of myopathy in hypothyroid patients.

Keywords: Myopathy, CK-Total, Creatinine, TSH.

INTRODUCTION

Thyroid gland dysfunction is one of the most commonly occurring endocrine disorders, globally. Insufficient thyroid hormonal secretions i.e. T3 and T4 and elevation in TSH hormone resulting in a clinical syndrome known as hypothyroidism particularly primary hypothyroidism.^[1] Hypothyroidism is considered as a metabolic disorder frequently affecting middle aged to elderly women. It has been estimated that the prevalence rate of primary hypothyroidism is 1:100.^[2]

Thyroid gland plays an essential role in maintaining normal growth and development of nearly, all the tissues. To maintain homeostasis in the body and in cell differentiation, thyroid hormones perform a crucial role. For assessing thyroid function, TSH is very sensitive and specific parameter as compared to other parameters and, it also has significance in early detection of thyroid disorders.^[1]

Earlier, hypothyroidism was said to occur mainly due to iodine deficiency but later autoimmune thyroiditis (Hashimoto's disease) and iatrogenic causes have become the common precipitating factors for hypothyroidism.^[3]

Due to hypothyroid disorders, there can be reduced metabolic functions in the body such as diminished and impaired carbohydrate, mineral metabolism, protein metabolism and others.^[1]

Due to myxoedematous infiltration including accumulation of glycosaminoglycans in the tissues including skeletal muscles hypothyroidism causes systemic effects in the body. In hypothyroidism during any time of disease process, neuromuscular and musculoskeletal manifestations are often observed, resulting in myopathy. Damaged skeletal muscle may be the major source of increased plasma Creatine Kinase (CK) activity in hypothyroidism.^[1] Creatinine is an excretory product derived from creatine phosphate which is largely present in muscle and excreted in urine.^[4] In severe hypothyroidism, hemodynamic changes results in decreased glomerular filtration rate and serum creatinine concentration may be expected to increase in hypothyroid patients. Due to hypothyroid myopathy serum creatinine level may also be increased, as a result hypothyroidism must be considered in patients with elevated serum creatinine level.^[2]

Therefore, present study was directed to determine the influence of thyroid hormones on creatine kinase (ck-total) and serum creatinine levels in hypothyroid patients.

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Ethics Approval

Ethics approval was obtained from TMMC Moradabad institutional Ethics Committee (TMMC-IEC) Ref. No. TMMC&RC /IEC/18-19/089.

MATERIALS AND METHODS

The present study was conducted on male & female patients (age group 20-50 years) diagnosed with hypothyroidism, attending the OPD and IPD of general medicine Teerthanker Mahaveer Hospital. The study group was comprised in different age groups of 70 primary hypothyroid patients.

Type of Study:

Observational and comparative.

Study Period:

Jan. 2019 to Dec.2019

Sample Collection:

With informed consent from patients' venous blood was drawn after overnight 8-12 hours fasting in aseptic conditions using a plain vial forestimation of serum creatinine, ck-total and thyroid profile.

Exclusion Criteria:^[1]

- Impaired renal function
- Heart disease, Hepatic disease
- Diabetic nephropathy and other causes for transient increase in creatine kinase like muscle injuries.

Methodology:

Thyroid hormone was estimated by ELFA technique using Vidas auto analyzer,^[5,6] Serum CK-Total activity was done by the UV-Kinetic method,^[7] Serum Creatinine was done by JAFFE'S method.^[8]



Figure 1: Vidas auto analyzer



Figure 2: Semi Auto analyzer

Statistical Analysis

Mean±SD were calculated for all the parameters analyzed and were compared by student's t-test and the parameters were calculated using SPSS program and Microsoft excel.

P values considered significant were as follows:

P <0.05 – As significant

P < 0.001 – As highly significant

RESULTS

Table 1: Comparison of Serum TSH between hypothyroid cases and control.

Parameters	Hypothyroid Cases (Mean±SD)	Control (Mean±SD)	P value
TSH (µIU/ml)	12.60±8.12	4.38±1.32	<0.001

The mean±SD of serum TSH level of hypothyroid patients (12.60±8.1 µIU/ml) is significantly higher than that of mean±SD of controls (4.38±1.32 µIU/ml) (p<0.001).

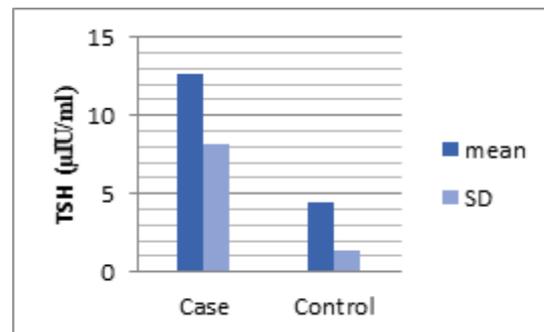


Figure 3: Comparison of levels of TSH between hypothyroid patients and controls.

Table 2: Comparison of ck-total activity between hypothyroid cases and control.

Parameters	Hypothyroid Cases (Mean±SD)	Control (Mean±SD)	P value
ck-total (IU/L)	314.35±72.89	67.13±40.52	<0.001

The mean±SD of total ck activity of hypothyroid patients (314.35±72.89 IU/L) is significantly higher than that of the mean±SD of controls which is (67.13±40.52 IU/L) (p<0.001).

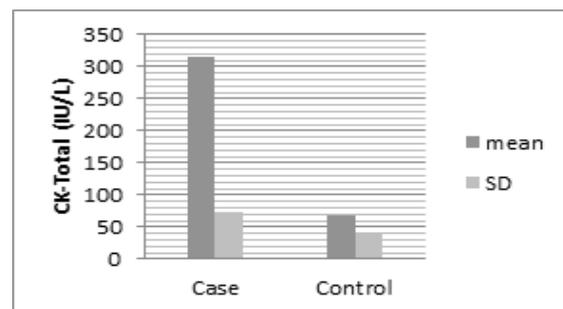
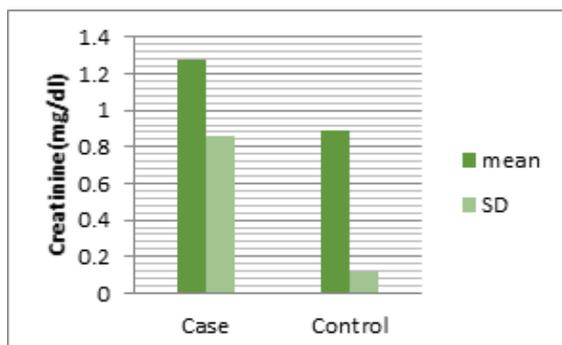


Figure 4: Comparison of levels of Total CK between hypothyroid patients and controls.

Table 3: Comparison of Serum Creatinine between hypothyroid cases and controls.

Parameters	Hypothyroid Cases (Mean±SD)	Control (Mean±SD)	P value
Creatinine (mg/dl)	1.28±0.86	0.89±0.12	<0.001

The mean±SD of serum creatinine of hypothyroid patients (1.28±0.86 mg/dl) is higher than that of the mean±SD of controls (0.89±0.12 mg/dl) (p=0.019) which is statistically insignificant.

**Figure 5: Comparison of levels of s.creatinine between hypothyroid patients and controls.**

DISCUSSION

Among known endocrine disorders around us, hypothyroidism is one of common disorder that causes insufficient production or diminished action of thyroid hormones. There are many factors leading to hypothyroidism and the clinical presentation varies with patient's age, gender, physical condition etc. Clinical laboratory assessment of thyroid function confirms the diagnosis of hypothyroidism.^[1] In the present study it has been found that the mean value of serum TSH (12.60±8.12 µU/ml) level was significantly higher in hypothyroid patients than that of the controls (4.38±1.32 µU/ml). [Table 1] The findings of the present study are similar to the findings of Ashok et al who has also found that the mean value of TSH (28.09±22.47) was significantly increased in hypothyroidism in comparison with the controls.^[9]

This present study shows that the mean value of total ck activity (314.35±72.89 IU/L) was significantly increased than that of the mean value of controls (67.13±40.52 IU/L). [Table 1]

The findings of this study are similar to the study done by Rashmi et al who revealed that in hypothyroid patients, lowered T3 (0.56±0.13 mcg/dl), T4 (4.99±0.68 mcg/dl) levels with an increase level of TSH (12.00±5.69µU/ml) associated with rise in serum CK level (54.23±6.20 IU/L) when compared to control (36.44±8.36 IU/L) which was used as a parameter for diagnosing hypothyroid patients.^[9] Increased CK-total activity in hypothyroid patients can be considered as valuable indicators for diagnosing myopathy.

This study also evaluates that the mean value of serum creatinine (1.28±0.86 mg/dl) of hypothyroid patients is higher than that of the mean value of controls (0.89±0.12 mg/dl). [Table 2] Our findings are similar to the study done by Aminul et al who also revealed that when compared to the controls S.Creatinine (1.01±0.17 mg/dl) is found significantly higher in hypothyroid cases (1.38±0.53 mg/dl).^[2] And this present study is also similar to the study done by Jia et al who showed significant higher levels of serum creatinine in cases (4.08±0.25 mg/dl) when compared to controls (0.62±0.05 mg/dl).^[10] Hence, these studies have shown varied observations.

Hypothyroidism shows their various effects on renal system which includes changes in water and electrolyte metabolism along with changes in renal haemodynamics including decreased renal blood flow which may be reflected in analysis of renal parameters like Serum Creatinine, Serum Urea and Serum Uric Acid.

CONCLUSION

The present study was done to evaluate the study of biochemical markers (CK-total and Serum Creatinine) of myopathy in hypothyroid patients.

In the present study, we have found that there is a rise in total CK in hypothyroidism. There is no cause affect relationship between CK-total activity and serum TSH. Current study also reveals that Serum Creatinine levels were also found to be higher in hypothyroid cases when compared to normal controls.

Therefore, we have concluded that the hypothyroid patients should be made to get assessed for Total CK and Serum Creatinine levels, which may lead to better treatment, prognosis of the disease and help to prevent or atleast relieve the symptoms of myopathy in hypothyroid patients.

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REFERENCES

1. Tejomani M, Meera KS, Vasudha KC. Relevance of creatine kinase activity and serum creatinine levels in hypothyroidism. *Int J Rec Tre Sci Techn.* 2013; 8(3): 263-9.
2. Khan MA, Majumder MI, Hoque MM et al. Serum creatinine and uric acid levels in hypothyroid patients: A cross sectional study. *J Ena Med coll.* 2013; 3(2): 84-7.
3. Khan AH, Majumder I. Serum creatinine and uric acid levels of hypothyroid patients. *Bang J Med Biochem.* 2010;3(2):61-3.
4. Satyanaryana DU, Chakrapani DU. Organ function test. *Biochem, Biomed, Clin, Corve, Stu.* 2017; 455-68.
5. Collignon I, Azais T. L exploration de la thyroïde, le moniteur de I internet. 1987; 39(1): 56-65.
6. Ekins R. Measurement of free hormones in blood- *Endocrine reviews.* 1990; 11(1): 5-46.

7. Dawson DM, Eppenberger HM. Creatine kinase. *BiochemBiophy, Res. Comm.* 2002; 21(2): 346-53.
8. Bowers, LD. Kinetic serum creatinine assays. *Clin Chem.* 2000; 26(5) 551-4.
9. Ranka R, Mathuri R. Serum creatinphosphokinase in thyroid disorders. *Ind J Cli Bio Chem.* 2003; 18(1) 107-10.
10. Jia D, Liang LB et al. The association between serum uric acid and creatinine in patients with hypothyroidism. *Sic Da Xue Ban.* 2015; 46(5): 747-9.

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