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RESEARCH ARTICLE

EVALUATION OF DIAGNOSTIC EFFICACY OF CREATINE KINASE AND LACTATE DEHYDROGENASE IN THYROID DISORDERS

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ABSTRACT

Thyroid hormones are involved in controlling various metabolisms in the body and imbalance in their production causes many metabolic processes to slow down and affects the entire metabolism. Present study was conducted at S.M.S Medical College, Jaipur aimed to evaluate biochemical parameters Creatine kinase (CK) and Lactate dehydrogenase (LDH) in diagnosing thyroid disorders along with thyroid-stimulating hormone [TSH], tri-iodothyronine [T3] and thyroxine [T4]. 50 hypothyroid and 50 hyperthyroid patients were compared with 75 age, sex and socioeconomic status matched healthy controls. In Hypothyroid patient significant increase in level of CK and LDH were found compared to control while in Hyperthyroid patient CK and LDH were on lower side. These findings suggest that Creatine kinase and Lactate dehydrogenase can be used as parameters for screening along with thyroid profile.

INTRODUCTION

The thyroid gland is one of the largest endocrine gland found in the neck, below the thyroid cartilage. The gland produces hormones which play important role in control of basal metabolic rate (BMR), general body metabolism, growth, development and tissue differentiation. Imbalance in production of thyroid hormones arises from dysfunction of the thyroid gland which is one of the most common endocrinological disorders. There is a high burden of thyroid diseases in India. Thyroid disease is being increasingly diagnosed with greater awareness and is one the chronic non – communicable disease affecting women more though male population is not spared of the ailment. In India thyroid disorders are in a transition zone from a predominant iodine deficient nation to now a iodine sufficient population. Laboratory measurement of thyroid-stimulating hormone [TSH], tri-iodothyronine [T3] and throxine [T4] are important for diagnosis of thyroid abnormalities. (Mittal et al., 2010) Thyroid stimulating hormone is a very sensitive and specific parameter for assessing thyroid function and has significance in early detection or exclusion of thyroid disorder. Musculoskeletal disorders often accompany thyroid dysfunction and serum CK and LDH become important clinical marker for muscle damage.

Musculoskeletal disorders are common in patients with hypothyroidism, they are also observed in thyrotoxicosis and level of CK is altered in both these conditions. (Cakir et al., 2003) In recent years, studies have been conducted to establish a relationship of CK levels in thyroid diseases. (Finstere et al., 1999; Wan Nazaimoon et al., 2001) Skeletal muscle is affected by hypothyroidism more profoundly in cases of overt hypothyroidism and less so when subclinical hypothyroidism is present. (Hekimsoy and Oktem, 2005; Sakaki et al., 2004) Serum LDH activity according to studies increased in hypothyroid and decreased in the hyperthyroid states. (Roti et al., 1980) Thus, it shows that assay of CK and LDH activity in serum may prove to be valuable in screening of thyroid disorders and in the present study, we tried to evaluate the role of CK and LDH as an alternative diagnostic tool in patients of thyroid disorder.

MATERIALS AND METHODS

The present study was conducted from November 2013 to December 2014 in Department of Biochemistry at S.M.S Medical College and Hospital, Jaipur. The study comprised of 50 Hypothyroid, 50 Hyperthyroid patients and 75 age, sex and socioeconomic matched healthy controls coming to Endocrinology /Medical OPD/ immunoassay lab for TSH estimation who have not taken any treatment for hypothyroidism n hyperthyroidism yet.

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Individual within 20–60 age groups and without any chronic condition other than thyroid with serum levels of TSH >4.25 μ IU/ml in hypothyroid and TSH<0.40 μ IU/ml in hyperthyroid cases. Exclusion criteria was taken to rule out other diseases which can alter the results of study like Hepatic disorders, Bone and muscle diseases, Cardiac, pancreatic, hepatobiliary diseases, Diabetes and hypertension. Venous blood was withdrawn for investigations taking all aseptic precautions. Serum was separated and investigated for measurement of CK, LDH, FT₃, FT₄ and TSH. All the statistical analysis were performed using SPSS version 19.0. Data were presented as mean \pm SD.

RESULTS

The present study was conducted to evaluate the level of CK and LDH in Hypothyroid and Hyperthyroid patients. Table -1 shows levels of Serum enzymes in control and study group. The mean values of FT3 and FT4 in hypothyroid patients were 2.5 \pm 0.7 pg/dl and 0.7 \pm 0.3 ng/ml which was lower than control group having mean value of FT3 and FT4 3.0 \pm 0.8 pg/dl and 1.4 \pm 0.3 ng/ml, respectively. TSH levels was 40.3 \pm 26.8 μ IU/ml while in control the level was 2.2 \pm 1.0 μ IU/ml. The mean values of FT3 and FT4 in hyperthyroid patients were 4.55 \pm 2.0 pg/dl and 2.3 \pm 1.9 ng/ml respectively. TSH level was 0.2 \pm 0.1 μ IU/ml which is lower than control and hypothyroid patients. The CK value was 276.1 \pm 96.2U/L in Hypothyroid which was significantly higher than control group with level 154.8 \pm 39.2U/L and 77.3 \pm 26.1U/L in Hyperthyroid individuals. The LDH level is 410.4 \pm 67.8U/L in hypothyroid patients and 200.3 \pm 21.9U/L, 304.1 \pm 59.9U/L in hyperthyroid and control group. There was statistically significant difference in CK and LDH activities in patients with thyroid disorder and control group. In Graph- 2 a positive correlation was found between TSH and CK (r = 0.561) and TSH and LDH(r = 0.41) while a negative correlation was found between FT4 and FT3 with CK and LDH.

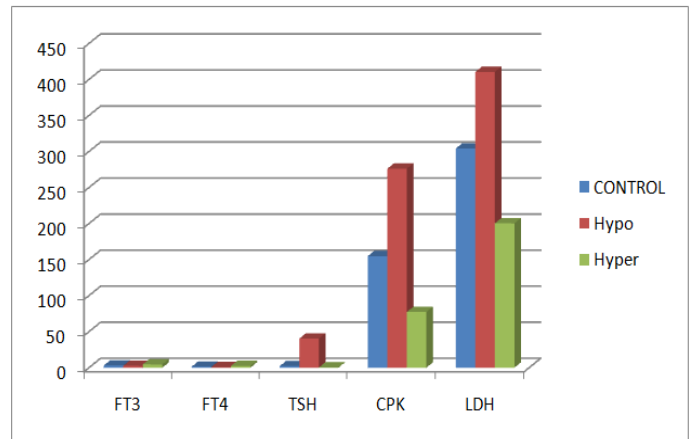
DISCUSSION

The findings of this study confirm that elevated serum CK and LDH activity is frequently increased in hypothyroidism and decreased in hyperthyroidism. Serum level of Creatine kinase and Lactate dehydrogenase increased in hypothyroidism. (Klein and Ojamaa, 2004; Hussein *et al.*, 1999) The isoenzymes patterns suggest that the source of increased creatine kinase and lactate dehydrogenase is skeletal, not cardiac muscle. The level of CK was significantly higher in Hypothyroid patients compared to controls which was in accordance with the study by Duyff *et al.* showing creatine kinase (CK) elevation in 57%–90% of patients with hypothyroidism (Duyff *et al.*, 2000). Burnett *et al.* (Burnett *et al.*, 1994) suggested that the clinical diagnosis of hypothyroidism should be considered in patients with unexplained persistent elevations of serum Creatine kinase. High serum CK concentration in hypothyroidism may be due to muscle fiber degeneration, altered muscle energy metabolism and decreased clearance of CK from circulation. Giampietro *et al* in 1984, found myoglobin and CK to be the best indicators of hypothyroid myopathy, since they are sensitive for the early detection of muscle involvement due to

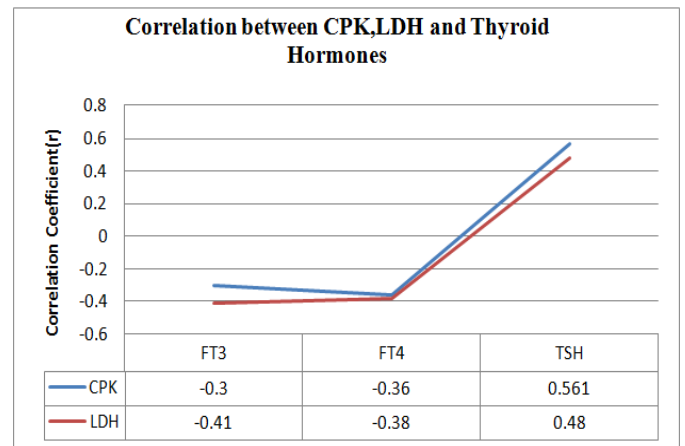
metabolic disorder and are closely correlated to the metabolic condition of patients.

Table 1. Levels of Serum FT3, FT4, TSH, CK, LDH in controls, Hypothyroid and Hyperthyroid Subjects

Parameters	Control	Hypothyroid	Hyperthyroid
FT3(pg/dl)	3.0 \pm 0.8	2.5 \pm 0.7	4.55 \pm 2.0
FT4 (ng/ml)	1.4 \pm 0.3	0.7 \pm 0.3	2.3 \pm 1.9
TSH(μ IU/ml)	2.2 \pm 1.0	40.3 \pm 26.8	0.2 \pm 0.1
CK (U/L)	154.8 \pm 39.2	276.1 \pm 96.2	77.3 \pm 26.1
LDH(U/L)	304.1 \pm 59.9	410.4 \pm 67.8	200.3 \pm 21.9



Graph 1. Levels of Serum Enzymes in controls, Hypothyroid and Hyperthyroid subjects



Graph 2. Correlation between CPK, LDH and Thyroid Hormones

(Giampietro *et al.*, 1984) In case studies, patients with hypothyroidism solely presented with symptoms of myositis and very high levels of CK which resolved after treatment for hypothyroidism. (Madhu *et al.*, 2010) In hyperthyroid cases CK level was on lower side compared to the control group. The finding of decreased CK activity in patients with hyperthyroidism compared with controls is in accordance with other studies. (Doran, 1978) and suggests that in the hypermetabolic state there may be increased enzyme degradation which may have contributed to these low CK activity. Fleisher GA *et al* reported 37% of hypothyroid

patients to have elevated LDH levels (Fleisher *et al.*, 1965). In another study by Tajiri *et al.* elevation of LDH activity was found in 33% of patients with overt hypothyroidism and in 74% of patients with subclinical hypothyroidism (Tajiri *et al.*, 1985). The elevations of LDH levels could reflect increased release and/or decreased clearance from the liver.

Conclusion

Because of the well documented muscular dystrophy in patients with thyroid disorders and the results obtained in the study it is concluded that CK and LDH can be used as an economical and efficient tool for diagnosis of thyroid disorders along with the thyroid profile.

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