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Study of Serum Amylase and Serum Creatinine in Subclinical Hypothyroidism

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Abstract

Introduction: Subclinical hypothyroidism (SCH) can be defined as a state of high serum thyroid stimulating hormone (TSH) levels (less than 10 μIU/ml) with normal serum free thyroxine (fT4) and triiodothyronine (fT3) levels in the presence or absence of symptoms. SCH is confirmed by laboratory diagnosis of serum picture of elevated thyroid stimulating hormone (TSH) and normal serum concentration of free thyroxine (fT4) and total Triiodothyronine (T3). The aim to this study was to determine levels of Serum Amylase, Serum Creatinine in Subclinical Hypothyroidism.

Material and Method: An observational cross-sectional study was conducted between November 2023 and October 2024, involving participants with and without Subclinical Hypothyroidism. Blood samples were analysed for serum amylase, creatinine levels to assess biochemical variations. Clinical data was collected from hospital records.

Result: 260 participants, 130 with subclinical Hypothyroidism and 130 healthy controls were recruited. The level of Serum Amylase increased from 60U/L in controls to 90.28 U/L in cases. ($p<0.001$). Similarly, the level of Serum Creatinine increased from 0.77 mg% to 1.06 mg% ($p<0.001$).

Conclusion: According to findings of the study there is significant change in levels of Serum Amylase, Serum Creatinine in Healthy Controls and Subclinical

Hypothyroidism showing a need for early detection and proper screening to prevent the progress of disease to adverse conditions.

Keywords: Subclinical Hypothyroidism, Serum Creatinine, Serum Amylase.

Introduction

The Thyroid gland is part of the endocrine system that produce thyroid hormones. Thyroxine (T4) and triiodothyronine (T3) are the two linked hormone produced and secreted by the thyroid gland.

These thyroid hormones are regulated by thyroid stimulating hormones (TSH) which is secreted by anterior pituitary gland, under the control of the hypothalamic thyrotropin releasing hormone (TRH). Thyroid gland primarily produces thyroxine (T4) which is then converted to more biologically active form triiodothyronine(T3). TSH is a very sensitive and specific parameter for determining thyroid function and is important in early detection or exclusion of thyroid related disorders.

The clinical condition arising due to deficiency of thyroid hormones or fall in the thyroid hormones below the physiologic reference range is known as Hypothyroidism. If untreated, it can lead to serious adverse health effects and ultimately death. Hypothyroidism is the most common pathologic hormone deficiency among the endocrine disorders, thyroid disease ranks second only to diabetes mellitus in prevalence, affecting over 1% of the general population and about 5% of individuals over age 60 years. Its further results in generalized fall in the metabolic processes of the body.[1]

Subclinical hypothyroidism (SCH) can be defined as a state of high serum thyroid stimulating hormone (TSH) levels (less than 10 μIU/ml) with normal serum free thyroxine (fT4) and triiodothyronine (fT3) levels in the presence or absence of symptoms.[2]

Subclinical hypothyroidism (SCH) is asymptomatic in general but it may progress to overt hypothyroidism. TSH level greater than 10 μIU/ml predicts a higher rate of progression to overt state than a level of less than 6 μIU/ml. It may be associated with manifestations that can be managed by treatment. However, symptoms suggestive of thyroid hormone deficiency may be present in 30% of patients.[3]

TRH inhibits amylase pancreatic secretion by a direct effect on acinar preparations. When TRH was decreased, the inhibition of pancreatic amylase is lost. These findings suggest that TRH could be an inhibitor of pancreatic amylase secretion, resulting in elevated amylase and lipase levels in hypothyroidism.[4]

Hypothyroid state is associated with significant derangement in biochemical parameters of renal function. Serum creatinine is elevated and glomerular filtration rate (GFR) values are reversibly reduced in overt hypothyroid patients than in euthyroid subjects.[5]

Material and Methods

The present study was carried out in Department of Biochemistry, Government Medical College, Super Specialty Hospital, Central Laboratory NMCH and MBS Hospital Kota.

Study Design: The study design is analytical cross-sectional study.

Material: Questionnaire, Thyroid Profile (fT3, ft4 and TSH), Serum Amylase and Serum Creatinine.

Study Group

130 newly diagnosed cases of Subclinical hypothyroidism attending Medical O.P.D of GMC, Kota were included and 130 age-sex matched euthyroid

controls were selected all age between 20-50 yrs of both sexes.

Inclusion Criteria

For Control Group (Group I)

- Age and sex matched healthy individuals without subclinical hypothyroidism.

For Study Group (Group II)

- Age group between 20-50 year of both sexes diagnosed as SCH individuals
- Clinically euthyroid persons.

Exclusion Criteria

- Persons with coronary artery disease
- Persons with diabetes or those with stroke
- Persons with a history of arthritis
- Smokers/alcohol users
- On diuretics
- Thyroid supplementation and antithyroid agents.

Methodology

Venous blood sample were collected from all the participants under aseptic precaution from antecubital vein by venipuncture in plain vials. Serum was separated by centrifugation at 2500 rpm for 10 minutes and subjected to following assays:

(a) Thyroid Profile (fT3, fT4 & TSH): - by Chemiluminescence Immunoassay method (CLIA).

(b) Serum Amylase: - by Enzymatic colorimetric method (Ying Foo A et al. 1998)

(c) Serum creatinine: - by Jaffe's colorimetric kinetic method

Observation

Table 1: Comparison of Free tri-iodothyronine (fT3), free thyroxine (fT4) and thyroid stimulating hormone (TSH) levels between healthy subjects and subjects with subclinical hypothyroidism.

Biochemical Parameters	GROUP-I Healthy Subjects Mean±SD (n=130)	GROUP-II Subjects with subclinical hypothyroidism Mean±SD (n=130)	'p' Value
fT3(pg/ml)	3.25±0.10	3.05±0.34	HS (p<0.0001)
fT4(ng/ml)	0.82±0.03	1.33±0.23	
TSH(µIU/ml)	2.53±0.71	8.70±0.93	

Figure 1: Comparison of Free tri-iodothyronine (fT3), free thyroxine (fT4) and thyroid stimulating hormone (TSH) levels between healthy subjects (Group I) and subjects with subclinical hypothyroidism (Group II).

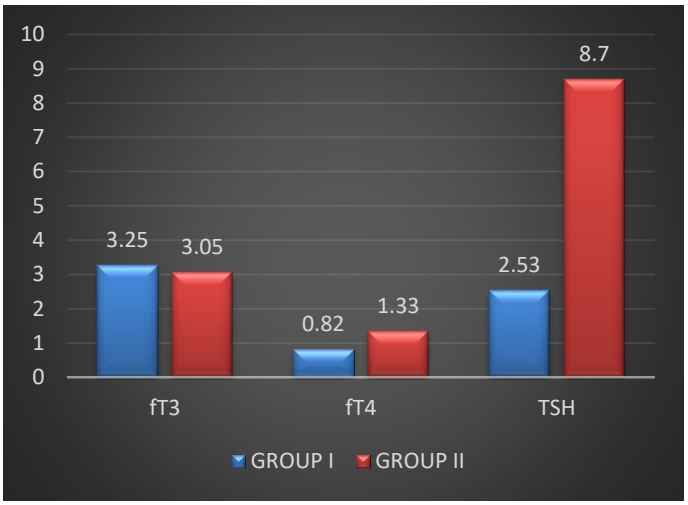

Table 1 and Figure 1 summarize thyroid parameters in the study (130 healthy controls and 130 with subclinical hypothyroidism). Mean fT3 in controls was 3.25±0.10 pg/ml and in cases was 3.05±0.34 pg/ml. Mean ft4 in controls was 0.82±0.03 (ng/ml) and in cases was 1.33±0.23 pg/ml. Mean TSH in controls was 2.53±0.71(µIU/ml) and in cases was 8.70±0.93 (µIU/ml). All these results were statistically significant (p<0.001).

Table 2: Comparison of Serum Amylase levels in healthy controls and subjects with Subclinical Hypothyroidism.

Biochemical Parameters	GROUP-I Healthy Subjects Mean±SD (n=130)	GROUP-II Subjects with subclinical hypothyroidism Mean±SD (n=130)\	'p' Value
Serum Amylase (U/L)	60±8.87	90.28±5.23	HS (p<0.0001)

Figure 2: Comparison of Serum Amylase levels in healthy controls and subjects with Subclinical Hypothyroidism.

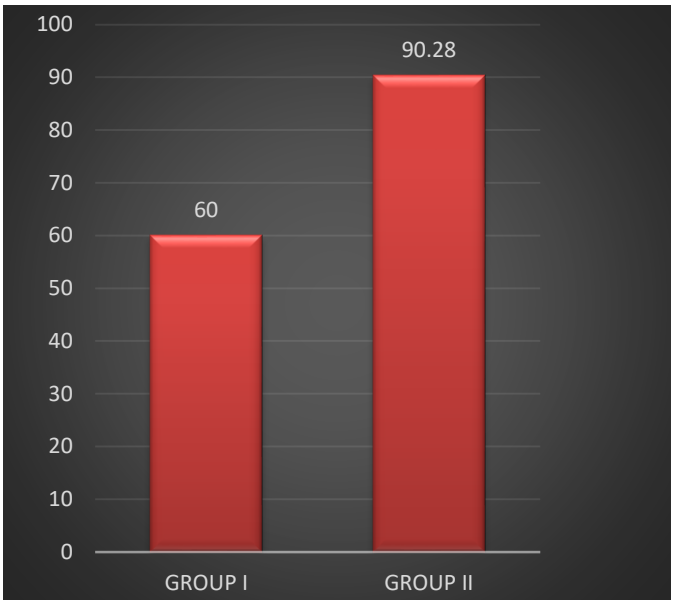

Table 2 and Figure 2 summarize mean Serum Amylase levels in controls (60±8.87U/L) and (90.28±5.23 U/L) showing a significant increase in levels of serum amylase from Euthyroid to Subclinical Hypothyroidism. (p<0.001)

Table 3: Comparison of Serum Creatinine levels in healthy controls and subjects with Subclinical Hypothyroidism.

Biochemical Parameters	GROUP-I Healthy Subjects Mean±SD (n=130)	GROUP-II Subjects with subclinical hypothyroidism Mean±SD (n=130)	'p' Value
Serum Creatinine (mg/dl)	0.77±0.08	1.06±0.13	HS (p<0.0001)

Figure 3: Comparison of Serum Creatinine levels in healthy controls and subjects with Subclinical Hypothyroidism.

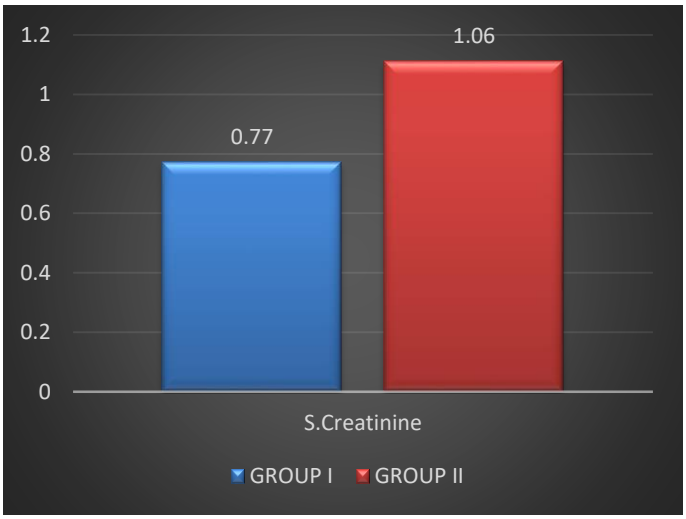

Table 3 and Figure 3 summarize levels of Serum Creatinine in Healthy Controls

(0.77±0.08 mg/dl) and Cases (1.06±0.13 mg/dl) showing a significant increase from Euthyroid to Subclinical Hypothyroidism. (p<0.001)

Result

It was an Analytical Cross-sectional, Hospital based study of 260 participants (130 Euthyroid controls and 130 cases with Subclinical Hypothyroidism) between age group 20-50 years.

It was found that the study group had higher levels of Serum Amylase and Serum Creatinine compared to the

mean levels of Amylase and Creatinine of controls and the result was statistically significant (p<0.001)

Discussion

The prevalence of SCH is between 3% and 18% in the general population in India and higher in women than in men. SCH patients are at risk for progression to overt hypothyroidism with an average yearly progression rate of 2% to 6% with an increased risk in females.

Thyroid hormones are also indispensable for the renal system growth and for maintaining the homeostasis of fluid and electrolytes levels. In recent years, subclinical hypothyroidism is unknowingly emerging as a major public health problem in India and it produces an enormous burden on the economy of the country due to high prevalence, risk of progression to overt hypothyroidism and it can lead to adverse cardiovascular consequences.

Subclinical Hypothyroidism (SCH) and Overt Hypothyroidism (OH) are common in the elderly people especially in the women. Subclinical hypothyroidism carries the risk of developing overt hypothyroidism, subsequent cardiovascular health risks and renal dysfunction.

Table-1 shows that the Mean ± SD of fT3, ft4 levels were less in subjects with subclinical hypothyroidism (3.05±0.34 pg/dl); (1.33±0.23 ng/dl) than healthy controls (3.25±0.10 pg/dl) (0.82±0.03ng/ml) and difference was statistically highly significant (P<0.0001).

Our findings are also in agreement with Bhutal MB et al. (2020) which also suggested that serum fT3 and ft4 levels were significantly lower in subjects with subclinical hypothyroidism as compared to normal healthy controls.[6]

Table-1 shows that the Mean ± SD of TSH levels were more in subjects with subclinical hypothyroidism ((8.70±0.93 µIU/ml) than healthy controls (2.53±0.71 µIU/ml) and difference was statistically highly significant (P<0.0001).

Our studies are in agreement with Bhutal MB et al. (2020) which shows statistically significant increase in serum TSH level in subjects with subclinical hypothyroidism as compared to healthy controls.[6]

Table-2 shows that the Mean ± SD of serum amylase level was more in subjects with subclinical hypothyroidism (90.28±5.23 U/L) than healthy controls (60±8.87U/L) and difference was statistically highly significant (P<0.0001).

Our findings are in line with Yong-Wei Xu et al. (2020) also concluded that patients with reduced thyroid function showing statistically significant increase in serum amylase as compared to healthy controls.[7]

Table-3 shows that the Mean ± SD of serum creatinine level was more in subjects with subclinical hypothyroidism (1.06±0.13 mg%) than healthy controls (0.77±0.08mg%) and difference was statistically highly significant (P<0.001).

A similar trend was reported in a study done by Patil VP. et al. (2018) showing that though serum creatinine levels were within the normal reference range, it was significantly higher in subjects with subclinical hypothyroidism as compared to healthy controls.[8]

Conclusion

The overall finding of present study has revealed that serum fT3, serum fT4 are significantly lower in subjects with subclinical hypothyroidism as compared to normal healthy subjects whereas serum TSH is significantly high in subjects with subclinical hypothyroidism as compared to normal healthy subjects.

Serum amylase, serum creatinine was significantly raised in subjects with subclinical hypothyroidism as compared to normal healthy subjects.

Monitoring creatinine helps assess whether SCH is contributing to early renal dysfunction and pancreatic enzyme activity Therefore, proper screening of subclinical hypothyroidism and associated complications is necessary, as life style modification and pharmacotherapy can control these conditions and thereby reduce risk.

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