

Assessment of the relationship between serum albumin and thyroid function in Hypothyroid subject**Munmun Saha¹, Mita Saha², Subhajoy Maitra³**¹Assistant Professor, Department of Biochemistry, Jagannath Gupta Institute of Medical Sciences and Hospital, Buita, Raypur, West Bengal, India²Professor and HOD, Department of Biochemistry, Jagannath Gupta Institute of Medical Sciences and Hospital, Buita, Raypur, West Bengal, India³Assistant Professor, Department of Community Medicine, Jagannath Gupta Institute of Medical Sciences and Hospital, Buita, Raypur, West Bengal, India

Received: 05-05-2026 / Revised: 07-06-2026 / Accepted: 08-07-2026

Corresponding Author: Dr. Munmun Saha

Conflict of interest: Nil

Abstract:

Rationale of study: Thyroid disorder is highly prevalent in India. There are studies of thyroid hormone status and Albumin level in Malnutrition, Preeclampsia, Chronic kidney diseases in diabetes but few studies related to thyroid hormone, its metabolic function and renal haemodynamic of Albumin. So for better management of hypothyroid cases, we focus on to find out correlation of serum FT4, serum TSH with serum Albumin in our study. We choose Hypothyroid cases in age group 18-75 years.

Objective of study: General: Relationship between FT4 and Albumin in Hypothyroid cases.

Specific: (1) To assess whether decrease in serum FT4 level, also there is decrease in serum Albumin Level. (2) To assess whether serum TSH level correlate with serum albumin

Method: Cross sectional and longitudinal clinical study of sample size 100 (case+Healthy subject) in age group of 18-75 years. Serum FT4 assessed by immunoassay. TSH assessed by chemiluminescence method, serum Albumin by Biochemical method. Statistical analysis done by SPSS.

Result: Serum Albumin level are significantly altered in Hypothyroid cases compared with Healthy subjects ($p=0.03$).

Conclusion: These finding suggest that hypothyroidism may affect Albumin homeostasis possibly through alteration in protein metabolism and renal haemodynamic of Albumin.

Keywords: Hypothyroidism, serum Albumin, Thyroid function, Thyroid hormones, Free thyroxine (FT4), Triiodothyronine (T3), Thyroid stimulating hormone (TSH), Biochemical parameter, Protein Metabolism, Correlation, Analysis.

MeSH Keywords: Hypothyroidism, Albumin, Thyroxine, Triiodothyronine, Thyrotropin, Thyroid function test, Protein metabolism, Biomarker.

DOI: 10.25258/ijcpr.18.7.37

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Thyroid hormone is necessary for embryonic development of kidney as it regulate directly and indirectly physiologic function of kidney [1]. It directly regulate glomerular function, tubular absorption, secretory capacity and different electrolyte and indirectly it influence cardiovascular system that affect renal blood flow [2]. Synthesis, secretion, metabolism and elimination of thyroid hormone are also influenced by kidney as kidney is a target organ for thyroid hormone action [2,3]. Such dynamic interplay can cause dysthyroid state (hypo or hyperthyroid) with simultaneous changes in renal parameter like GFR, urine specific gravity [4,5,6] with consequent change in serum albumin. Albumin

is transporter of thyroxine, thyroid binding globulin, Total triiodothyronine [7]. Our present study is to focus on thyroid hormone and albumin to find out correlation between serum free thyroid hormone and serum albumin.

Thyroid hormone stimulate synthesis of albumin in the liver at a PR translational level. It promote various types of protein metabolism and studies show it increase synthesis of specific hepatic protein including albumin [8]. Thyroid hormone increase the total cellular RNA in the liver, leading to a higher production of specific mRNAs that encode for secretory protein like albumin [9].

Thus our present study is to focus on hypothyroid cases(primary, secondary and subclinical) and serum albumin level of these cases to find out if thyroid hormone T₄ influence hepatic albumin synthesis and influence absorption of albumin from renal tubule.

Material and Method:

The study was a hospital based case control study conducted at a tertiary care centre in west Bengal, India. The study was approved by the institutional ethical committee of JIMSH hospital .

Informed consent of participants were taken as samples are collected from previous laboratory data.

Duration of the study was 24 months when 100 samples (4 hypothyroid cases, 20 subclinical hypothyroid cases, 2 pituitary hypothyroid cases) were collected of adult age group 18-75 years and their thyroid parameter and serum albumin level were noted down from laboratory data. Parameter noted were assayed in Erba XL640 plus and Erba XL1000. The quality of the results were validated with internal quality control IQC procedure and participation to an External quality assessment scheme. The study was carried out in accordance with declaration of Helsinki and with the term of local legislation. Statistical analysis was done by Microsoft excel 2013 and calculator and SPSS version 20 .

	Primary hypothyroid cases		Subclinical hypothyroid cases		Pituitary hypothyroid cases		Total hypothyroid (primary, subclinical, pituitary) cases	
	case(4)	Healthy(4)	case(20)	Healthy(20)	case(2)	Healthy(2)	case(26)	healthy(59)
Mean Albumin level	2.9g/dl	3.4g/dl	3.08g/dl	3.3g/dl	3.2g/dl	3.8g/dl	3.06g/dl	3.4g/dl
Mean FT ₄	0.61ng/dl	1.5ng/dl	1.26ng/dl	1.4ng/dl	3.2ng/dl	1.34ng/dl	1.08	1.30
P value	0.3		0.1		0.7		0.03	

GET DATA /TYPE=XLSX

/FILE='F:\excel sheet of hypothyroid case and healthy subject.xlsx'

/SHEET=name 'Sheet1'

/CELLRANGE=full

/READNAMES=on

/ASSUMEDSTRWIDTH=32767.

EXECUTE.

DATASET NAME DataSet1 WINDOW=FRONT. T-TEST GROUPS=Group(1 2)

/MISSING=ANALYSIS

/VARIABLES=FreeT₄ TSH Albumin

/CRITERIA=CI(.95).

T-Test

[DataSet1]

Group Statistics

Group	N	Mean	Std. Deviation	Std. Error Mean
FreeT ₄	26	1.09	0.393	0.077
Hypothyroid Healthy control	59	1.27	0.448	0.058
TSH	26	11.48	18.638	3.655
Hypothyroid Healthy control	59	1.83	1.085	0.141
Albumin	26	3.07	0.792	0.155
Hypothyroid Healthy control	59	3.41	0.619	0.081

Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means	
	F	Sig.	t	df
FreeT ₄ Equal variances assumed	3.422	0.068	-1.787	83
Equal variances not assumed			-1.881	54.195
TSH Equal variances assumed	11.853	0.001	3.990	83
Equal variances not assumed			2.637	25.075
Albumin Equal variances assumed	0.804	0.372	-2.129	83
Equal variances not assumed			-1.935	39.060

Independent Samples Test

	t-test for Equality of Means			
	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Lower
Free T4 Equal variances assumed	0.078	-0.182	0.102	-0.384
Equal variances not assumed	0.065	-0.182	0.097	-0.376
TSH Equal variances assumed	0.000	9.645	2.417	4.837
Equal variances not assumed	0.014	9.645	3.658	2.112
Albumin Equal variances assumed	0.036	-0.339	0.159	-0.655
Equal variances not assumed	0.060	-0.339	0.175	-0.693

Discussion

From sample we collect, 26 of them were hypothyroid cases (subclinical hypothyroid, primary hypothyroid, central hypothyroid cases). Of them, 4 patients with decreased FT4 and increased TSH level (or primary hypothyroid cases) and their mean FT4 is 0.61 ng/dl (normal FT4 0.8-1.8 ng/dl) while their mean serum Albumin level is 2.9 g/dl (normal 3.5-5 g/dl), (P-value 0.3) in independent student t test to compare mean. So, although mean albumin level of this group when compared with similar number of healthy individual is less than normal albumin level but in independent t test value is not <0.05 and so not statistically significant. This is supported by Ubersichten et al [9]: Springer Nature: where they found thyroid hormone stimulate synthesis of Albumin at PR translational state and so in Primary hypothyroid cases, there is decrease in synthesis of Albumin. Of them 20 cases of subclinical hypothyroid cases with normal FT4 level and increased TSH level and all of them show their mean FT4 is 1.26 ng/dl and their mean albumin level 3.08 g/dl, (P value=0.1) in independent student t test to compare mean. So, when mean albumin level of subclinical hypothyroid cases is compared with mean albumin level of equal number of healthy individual, the value is much lower in subclinical cases but as P value is not <0.05 in independent t test, so it is not statistically significant. This is supported by Den Hollander JG, Welkan RW, Mentel MJ et al [2] where they found thyroid hormone regulate glomerular function, tubular reabsorption. So, in subclinical hypothyroid cause less Albumin. 2 cases of pituitary hypothyroid cases with low FT4 value normal TSH or decreased FT4, decreased TSH level and their mean FT4 is 0.44 ng/dl and their mean serum albumin level is 3.2 g/dl (P value=0.7) in independent student t test to compare mean. So, although mean albumin level of this group when compared with similar number of healthy individuals, the value is less than normal albumin level but in independent t test value is not <0.05 and so not statistically significant. This is supported by Yazhang, Rnijie xie, Junon et al [7] where they found thyroid hormone stimulate synthesis. It also promote albumin catabolism (increased degradation) resulting in a faster overall turnover rate. Clinical aspect: in

hyperthyroidism, rapid turnover leading to decreased serum albumin while in hypothyroidism, lower albumin production and slower degradation.

In total hypothyroid cases (primary hypothyroid, pituitary hypothyroid, subclinical hypothyroid) show mean FT4 is 1.08 ng/dl and their mean albumin level 3.06 g/dl (normal 3.5-5 g/dl) whereas 59 control with mean FT4 value 1.30 ng/dl (normal) and normal TSH value between 0.4-4 mIU/l with mean serum albumin level 3.4 g/dl or 3.5 g/dl which is also normal albumin level. So a definite physiological correlation exist between FT4 and serum albumin level seen in hypothyroid cases in my study. As with decreased FT4 in hypothyroid cases there is decreased serum albumin level than normal cases. This study is supported by Goutam Das, Peter N Taylor, Hyssam Abasabin et al [1] where they found that thyroid hormone regulate physiologic function of kidney. So more thyroid hormone, more albumin absorption and decrease albumin secretion. Now student unpaired independent t test is done to compare the mean of albumin level of hypothyroid cases with healthy subjects and here p value is 0.03 which is statistically significant. So, value of serum albumin level in hypothyroid cases is much lower than albumin level of healthy subject. This is supported by Den Hollander JG, Walker RW, Mentel MJ et al [2] where they found thyroid hormone regulate glomerular function, tubular reabsorption, secretory capacity. So, more TSH or less FT4 level and so decreased albumin level as less albumin is reabsorbed by less FT4.

The study has certain limitations. As number of patients in study group was not large, one should not apply present finding at any other population. Our study was conducted at a tertiary care hospital. In our country, a large number of populations visit district, subdivisional and lower tier hospital for treatment. So our study should not reflect entire population. Hence a multicentric study on a larger number of people is required to have a robust statistic. Adjustment of confounding factors (ethnicity, religion, dietary habit, physical activity etc.) were not done.

Conclusion

Although albumin level tended to be lower in primary, pituitary and subclinical hypothyroid patients than in healthy subjects, the difference were not statistically significant when these groups were analysed separately ($P > 0.05$). However, when all hypothyroid cases were combined, the difference became statistically significant ($P = 0.03$) suggesting an overall association between hypothyroidism and reduced serum albumin level. So, our study suggests thyroid hormone influence protein metabolism as it stimulate synthesis of albumin at PR translational state[9]. So, it is very logical to monitor serum albumin level in all hypothyroid cases from very beginning and to treat them accordingly in hypothyroid cases. Thyroid hormone supplement may enhance albumin synthesis to some extent.

References

1. Goutam Das, Peter N Taylor, Hussam Abusabmin, AMER Ali, John Geen et al Relationship between serum thyrotropin and urine albumin excretion in euthyroid subject with diabetes I: Annals of clinical biochemistry; International journal of laboratory Medicine. Volume 56, Issue1. January 2019, pages:155-162.
2. Den Hollander JG, Wulkan RW, Mantel MJ et al. Correlation between severity of thyroid dysfunction and renal function. Clin Endocrinol (oxf). 2005;62:423-427.
3. Kaptein EM, Guion-verde H, Hassry SG, Haemodynamic effect of thyroid hormone. Contrib Nephrol 1984;41:151-159.
4. Van Haekl, Daminat S. Interactions between thyroid and kidney function in pathological conditions of this organ system. A review. General comparat endocrinol 2009;160:205-215.
5. Villabona C, Sahu M, Roca M et al: Blood volume and renal function in and subclinical primary hypothyroidism. Am J Med Sci 1999; 318:277-280.
6. Vargas T, Morano JM, Rodrigen2G, Vascular and renal function in experimental thyroid disorders et al Endocrinol 2006;154:197-212.
7. Yazhag, Ruijie Xie, Junon et al A u shaped association between serum albumin with total Triiodothyronine in adult. Journal of clinical laboratory analysis. June 2022 volume 36, issue 6.e24473
8. Spinger Nature: Uber Sichen, Volume 62, Page 97-102(1984):Thyroid hormone action on intermediary metabolism.