

Original Article**“Study of Body Composition Parameters namely Body Fat percentage and Lean Body Mass percentage in Hypothyroidism.”****Authors:****Supriya Shrimant Ohal ^{1*}, Bhagchandani. R. A ² Phatak. M. S. ³**

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NAME, ADDRESS, TELEPHONE, E-MAIL ID OF THE CORRESPONDING AUTHOR:**Dr. Supriya Shrimant Ohal,****Associate Professor, Department of Physiology, Vedanta Institute of Medical Sciences, Dahanu, Maharashtra, India****Phone: 9112068443 / 9834619194.****E-mail: supriya84.rathod@gmail.com****ABSTRACT:**

Background: Most common functional disorder of the thyroid gland is Hypothyroidism. It is characterised by various clinical manifestations resulting from deficiency of thyroid hormones. It is estimated that about 01% to 10% of the worldwide population suffers from thyroid disorders. Thyroid profile in Hypothyroidism should be monitored regularly and prompt treatment with Levothyroxine is mandatory to prevent various complications in these cases.

Objectives: Present study was undertaken to study two Body Composition Parameters namely first was Body Fat percentage and second Lean Body Mass percentage in newly diagnosed hypothyroid subjects and in hypothyroid subjects who were receiving thyroxine supplementation therapy for more than 5 years. Study also aimed to find out if there was any significant improvement in these parameters after treatment.

Material and methods: Ninety adults (Males & Females) of age group more than 30 years were selected after screening from the Medicine Out Patient department of this Institute. They were divided into three equal groups of 30 subjects (28 female and 2 males) each belonging to the same socio-economic status. Group I: Euthyroid subjects (Control group), Group II: Newly

diagnosed and untreated hypothyroid patients and Group III: Hypothyroid patients taking synthetic thyroid hormone for more than 5 years. Individual subjects having diabetes, pregnancy, cardiovascular, pulmonary, renal or liver diseases and endocrine disorders other than hypothyroidism were strictly excluded from the study. The study protocol was approved by the Institutional Ethics Committee.

Written informed consent was obtained from all the study subjects enrolled in the study. **Statistics Applied:** One-way ANNOVA test was applied to study statistically significant variation in three Groups and multiple comparisons between Group I vs. Group II, Group I vs. Group III, and Group II vs. Group III done by Tukey test.

Results and conclusions: Significantly high value of Body fat % was found in Group II as in comparison with Group I. No statistically significant difference in Body fat % was found in Group I and Group III. Value of Body fat % in Group III was found significantly lower as compared to Group II. Value of Lean Body Mass % was found significantly low in Group II as in comparison with Group I. No statistically significant difference in Lean Body Mass % was found in Group I and Group III. Significantly high value of Lean Body Mass % in Group III was found as compared to Group II. Thyroxine replacement causes increase in oxygen consumption, energy expenditure and improves over all metabolism in body and because of these values of body fat and lean body mass were almost normalised in group III as they were getting treatment more than 5 years

KEY WORDS:

Body Fat (%), Lean Body Mass (%), Thyroxine replacement

INTRODUCTION

The thyroid gland is one of the larger endocrine glands of the body. The gland secretes the thyroid

hormones, which maintain the level of metabolism in the tissues of body which is required for optimal normal function. Thyroid hormones regulate carbohydrate and lipid metabolism by stimulating Oxygen consumption by cells in the body and thereby influence body mass and mentation. [1]

Hypothyroidism is characterized by clinical manifestations resulting from thyroid hormone deficiency or from their impaired activity at tissue level.[2] It is observed that between 1% and 10% of the global population has some evidence of abnormally low thyroid hormones.[3]

Thyroid Problems are on the rise among Indians. Over 4.2 crores people in the country are estimated to suffer from such disorders making it increasingly important for people to pay attention to this often-overlooked health problem.[4] Unhealthy Life style, Dietary habits, stressful life, poor attention of individuals towards exercise, Yoga and Meditation techniques, lack of routine health care check-up, etc. contribute mainly towards underestimation of this commonly encountered thyroid problem especially in females. Laboratory diagnosis at earlier stage and supplementation therapy with levothyroxine can prevent complications of not only thyroid gland but also with those related to other endocrine disorders.

It was observed from various studies conducted globally and also in our Country that values of body composition parameters namely weight and BMI were comparatively increased in

hypothyroidism. [5,6,7,8] So in present study we wanted to see if there are changes in other body composition parameters like body fat and lean body mass calculated by Bio Impedance Analysis technique in hypothyroid subjects and hypothyroid subjects who were already on levothyroxine treatment.[9]

Present study also aimed to see whether simple, non-invasive, cost effective and easily assessable technique could be useful in screening, monitoring and treating such patients and whether it can be implemented on large scale for prevention of thyroid disorders.

Aims and Objectives

- 1) To study Body Fat (%) and Lean Body Mass (%) in newly diagnosed hypothyroid patients, hypothyroid patients taking treatment for more than 5 years and control group.
- 2) To study the effects of levothyroxine therapy on Body Fat (%) and Lean Body Mass (%).

Materials and Methods

The present study was carried out in the department of Physiology of Indira Gandhi Govt. Medical College and Mayo Hospital, Nagpur during the period from February 2013 to October 2014 with prior approval from the Institutional Ethics Committee and after obtaining proper informed written consent from all the subjects enrolled in the study.

METHODOLOGY:

The present study was a cross-sectional case-control study carried out on 90 Adults (Males & Females) having age more than 30 years and were divided into three equal groups of 30 subjects each.

Group I: Euthyroid subjects (Control group): This group consisted of 30 subjects (28 females and 2 males) selected randomly from healthy volunteers from general population. These subjects were not having any known or diagnosed illness and their thyroid profiles were within normal range.

Group II: Newly diagnosed and untreated hypothyroid patients. This group included 30 (28 female and 2 males) patients who were recently diagnosed as having hypothyroidism (either raised TSH above normal with total T4 and T3 within normal range or raised TSH with below normal total T4 and T3) and hormone replacement therapy was not yet started.

Group III: Hypothyroid patients taking synthetic thyroid hormone for more than 5 years. This group included 30 (28 females and 2 males) hypothyroid patients who were already taking synthetic thyroid hormone replacement therapy for more than 5 years.

All the study subjects were selected from the outpatient department of Indira Gandhi Government Medical College and Mayo Hospital, Nagpur which were having same socio-economic status. Patients having diabetes, pregnancy, cardiovascular, pulmonary, renal or liver diseases and endocrine disorders other than hypothyroidism were strictly excluded from the study.

PROCEDURE:

All participants were given detailed information about the study protocol. Proper communication and a good rapport were established with them. Every effort was taken to solve their queries and relieve their anxiety. Right to withdraw from the study at any stage was permitted without any hesitation to all the participants.

After taking detailed history with set of screening questions referring to the principal sign and symptoms of thyroid disease, thorough general and systemic examination, pathology and other laboratory investigations details were recorded in Case Report form.

Methodology: Body composition was done on **BODYSTAT 4000 QUAD SCAN BIO IMPEDANCE**

ANALYZER with patient in supine position and strictly fulfilling the following conditions:

- Empty stomach 4 to 5 hours prior to test
- No exercise or workout 12 hours prior to test
- No alcohol or caffeine consumption 24hours prior to the test

STATISTICAL METHODS:

Statistically significant variation in three Groups determined by one-way ANNOVA test and multiple comparisons

between Group I vs. Group II, Group I vs. Group III, and Group II vs. Group III done by Tukey test. The software

used in the analysis was SPSS 17.0 and Graph Pad Prism 5.0 version. Significant level was set as $p > 0.05$ was no

significant, $p < 0.05$ as significant, $p < 0.01$ as highly significant and $p < 0.001$ as very highly significant.

Observations and Results

Significantly high value of Body fat% was found in Group II as in comparison with Group I. No statistically significant difference in Body fat% was found in Group I and Group III. Value of Body fat% in Group III was found significantly low as compared to Group II.

Value of Lean Body Mass% was found significantly low in Group II as in comparison with Group I. No statistically significant difference in Lean Body Mass% was found in Group I and Group III. Significantly high value of Lean Body Mass% in Group III was found as compared to Group II.

Discussion

In present study we found significantly increased mean values of body fat % and decreased lean body mass % in Group II as compared to Group I. No significant deference in body fat % and lean body mass % was observed in Group I and Group III. In Group III low values of body fat % and high value of lean body mass % was observed as compared to Group II.

Increased body fat % in hypothyroid patients was found in study done by Seppel T et al [10] similar to findings in our study. Miyakawa M et al [5] also noted increased body fat % and decreased lean body mass% in hypothyroid patients. Dipankar SP et al [11] found increased body fat% in hypothyroid patients. Study done by Budhalakoti N et al [12] also reported similar findings of increased body fat% in their study.

In contrast to the findings of our study Garin MC et al [13] reported that subclinical hypothyroidism was not associated with differences in lean body mass and body fat percentage as compared with euthyroid subjects except that in elderly age groups. Santini F et al [14]

observed that the measurement of regional tissue composition showed decreased peripheral lean body mass whereas no changes were observed with peripheral fat mass. Roef G et al [15] reported that whole body fat mass displayed positive and lean body mass inverse associations with muscle cross-sectional area in patients with hypothyroidism as compared to euthyroid subjects.

Bakiner O et al [16] in their study reported that correction of hypothyroidism did not cause any improvement in body weight and body fat percentage. **Sirigiri S et al [17]** reported that Lean Body Mass decreases significantly without affecting Fat Mass after correction of hypothyroidism.

Thyroid hormones play important roles in regulating energy homeostasis, thermogenesis, oxygen consumption, lipid and glucose metabolism. Energy metabolism and heat production is decreased in hypothyroidism which leads to decreased BMR, decreased appetite, cold intolerance and slightly low body temperature, decreased proteins synthesis and degradation and this leads to retardation of both skeletal and soft tissue growth. Energy expenditure is decreased in hypothyroidism due to overall slowdown of metabolism so there is decrease catabolism of fats, carbohydrates, and lipids resulting in increase in body fat. After treatment with levothyroxine there occurs decrease in body fat.

Thyroxine replacement causes increase in oxygen consumption, energy expenditure and improves over all metabolism in body and because of this body fat and lean body mass were almost normalised in group III as they were getting treatment more than 5 years. [18,19]

Conclusion:

Thyroxine replacement causes increase in oxygen consumption, energy expenditure and improves over all metabolisms in body. Findings of Body fat and lean body mass findings can be replaced to normal level in patients getting thyroxine replacement treatment.

Suggestions:

Early screening approach with Body Composition Parameters i.e. Body Fat (%) And Lean Body Mass (%) and regular follow up in hypothyroid patients surely diminishes the extent of risk of systemic disorders and other complications associated with hypothyroidism.

Advantages:

BODYSTAT 4000 QUAD SCAN BIO IMPEDANCE ANALYZER is simple, less expensive, non- invasive and reliable method. Its reproducibility is an additional advantage.

Limitation and scope:

Study was carried out in small sample size but can be very useful as screening tool on large population.

Conflict of interest: Nil.

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Table 1(a): Comparison of body fat % and lean body mass % in three groups

Parameters	Group I (n=30) Mean± SD	Group II (n=30) Mean± SD	Group III (n=30) Mean± SD	F-value	p-value
Body Fat (%)	27.46±3.75	39.03±3.74	28.96±4.23	77.20	0.0002 ***
Lean Body Mass (%)	73.20±1.15	60.53±4.28	71.63±2.78	156.11	0.0003 ****

Table 1(b): Multiple Comparison: Tukey Test

Parameters	Group		Mean Difference	Std. Error	p-value	95% Confidence Interval
	Group I	Group II				
Body Fat (%)	Group I	Group II	-11.56	1.01	0.0009***	-13.98 - 9.15
		Group III	-1.50	1.01	0.305	-3.91 - 0.91
	Group II	Group III	10.06	1.01	0.0008 ***	7.65 - 12.48

Lean Body Mass (%)	Group I	Group II	12.66	0.78	0.0007***	10.80 - 14.53
		Group III	1.56	0.78	0.117	-0.29 - 3.43
	Group II	Group III	-11.10	0.78	0.0006***	-12.96 - -9.23

*p<0.05 significant, ** p<0.01 Highly Significant, p<0.001 very highly significant
p>0.05 non-significant.

Group I –Controls (Euthyroid)

Group II – Newly diagnosed untreated hypothyroid patients,

Group III – Hypothyroid patients taking treatment for > 5yrs

Graph 1: Comparison of body fat and lean body mass in three groups

