

# Effects of Hypothyroidism on Cardio-Respiratory Fitness

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## ABSTRACT

**Study Design:** Observational study design.

**Background:** Abnormality in the thyroid functioning has health consequences for the general public. It is established that clinical hypothyroidism is associated with abnormally high lipid profile. Cardio-respiratory fitness reflects the overall capacity of the cardiovascular and respiratory system.

**Purpose:** To compare the Cardio-respiratory fitness among Hypothyroidism and Euthyroid subjects.

**Methods:** This study was conducted on 60 subjects of the Age Group 30-40 Years. There were two Groups, Group I included 30 subjects with Hypothyroidism and Group II included 30 Euthyroid subjects. Height and weight were taken to calculate the BMI of the subjects. VO<sub>2</sub> max was evaluated through the Harvard step test to assess Cardio-respiratory fitness.

**Results:** Results of the study revealed that there was statistically significant ( $p < 0.01$ ) difference in Cardio-respiratory fitness between subjects with Hypothyroidism ( $36.19 \pm 3.55$ ) and Euthyroid subjects ( $45.76 \pm 2.912$ ).

**Conclusion:** The study concluded that Cardio-respiratory fitness was low among the subjects with Hypothyroidism. Hence a Cardiopulmonary rehabilitation program should be incorporated to patients with Hypothyroidism.

**Key Words:** Hypothyroidism, Cardio-respiratory fitness, VO<sub>2</sub> max.

## INTRODUCTION

Hypothyroidism is the clinical syndrome resulting from deficiency of thyroid hormones. Thyroid hormones are mandatory for various processes that are important for human metabolism. [1] The most common presenting complaints in patients with hypothyroidism include fatigue, weight gain, oedema, dyspnea and palpitations etc. Decreased level of thyroid hormones causes myopathies in inspiratory and expiratory muscles, alveolar hypoventilation and cause alteration in pulmonary functions. [2] It has been found that a minimal decrease in circulating thyroid hormones alters the myocardial

functions and changes in lipid profile which consequently increases the risk of cardiovascular diseases. [1]

Cardio-respiratory fitness (VO<sub>2</sub> max) reflects the overall capacity of cardiovascular and respiratory systems. Therefore this study was designed to assess the level Cardio-respiratory fitness of the hypothyroid patients as compared to Euthyroid subjects.

## MATERIALS AND METHODS

This observational study was conducted in the SGT Hospital, Budhera, Gurgaon to assess the cardiorespiratory fitness level in the hypothyroidism patients

as compared to Euthyroid subjects. The study was done on 60 subjects of the Age Group 30-40 Years. There were two Groups, Group I included 30 subjects with Hypothyroidism and Group II included 30 Euthyroid subjects. Height and weight were taken to calculate the BMI of the subjects. VO<sub>2</sub> max was evaluated through the Harvard step test to assess Cardio-respiratory fitness. Procedure was explained to all the subjects and written informed consent was taken.

**Harvard Step test:** The subject was instructed to step up and down on a 50 cm high bench for 5 minutes or up to exhaustion. Exhaustion is defined as the time when the subject cannot maintain the stepping rate for 15 seconds when the rate of stepping is set at 30 cycles per minute. Each cycle constituted 1 step up and 1 step down. Immediately at the end of this protocol the subject was asked to sit down. The pulse was measured for one complete minute immediately after exercise. Body weight and pulse rate was joined in the Astrand-Rhyning nomogram to obtain the value of VO<sub>2</sub> max.

Subjects with hypertension, ischemic or valvular heart disease, arrhythmia, previous vascular surgery, heart failure, respiratory disease, pulmonary hypertension, hepatic or renal dysfunction, diabetes mellitus, significant neurological or psychological disease and smokers or athletes were excluded from the study.

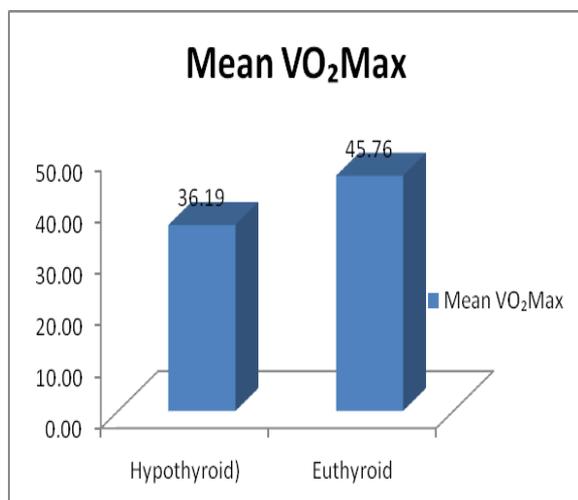
## STATISTICAL ANALYSIS AND RESULTS

Statistical analysis was done by using Unpaired t-test to test whether differences in means were statistically significant or not. Table 1 shows the parameters of the subjects in both the groups. The mean age group of Hypothyroidism and Euthyroid were 36.14± 7.89 years and 34.14 ± 7.89 years, BMI were 23.54±3.1 kg/m<sup>2</sup> and 21.2±2.12 kg/m<sup>2</sup> and VO<sub>2</sub> max were 36.19±3.55 ml/kg/min and 45.76±2.91 ml/kg/min respectively. There was significant decrease in VO<sub>2</sub> max in Hypothyroidism patients when compared to Euthyroid subjects (p<0.01). Graph 1 shows the difference in VO<sub>2</sub> max in Hypothyroidism patients and Euthyroid subjects.

**Table 1 Parameters of subjects in Hypothyroidism and Euthyroid Groups:**

Parameters	Hpothyroid (Group -I) Mean ± S.D.	Euthyroid(Group-II) Mean ± S.D.	t- Value	p- Value
Age (Years)	36.14 ± 7. 89	34.74 ± 5.121	0.988	0.417 <sup>NS</sup>
BMI (kg/mt <sup>2</sup> )	23.54 ± 3.1	21.2 ± 2.12	1.041	0.371 <sup>NS</sup>
VO <sub>2</sub> Max (ml/kg/min)	36.19 ± 3.55	45.7 ± 2.91	11.401	0.000**

\*\* Highly Significant; NS-Non Significant



**Graph 1 Difference of VO<sub>2</sub> max in Hypothyroidism patients and Euthyroid subjects.**

## DISCUSSION

This study provided a comparison of Cardio-respiratory between Hypothyroid patients and Euthyroid subjects. In this study, VO<sub>2</sub> max was found decreased in Hypothyroidism patients. Low VO<sub>2</sub> max in Hypothyroid patients is justified by the decrease in myocardial contractile force caused by structural changes in the ATPase enzyme described previously. [3] This reduction in the heart's pumping function decreases cardiac output, an important factor in determining the level of Cardio-respiratory fitness. A study by Sharma P et al demonstrated the elevated lipid profile in

Hypothyroidism subjects. [4] It is well known that dyslipidemia is the major contributing factor for the low physical fitness. Sharon Roel et al in their study found decreased in lung function compared to control subjects. [5] Reduction in lung function suggests the decrease in Cardio-respiratory fitness among the Hypothyroidism patients.

## CONCLUSION

From this study it is concluded that patients with Hypothyroidism patients exhibit less Cardio-respiratory fitness, therefore a cardiopulmonary rehabilitation program should be incorporated to patients with Hypothyroidism.

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