



TO EVALUATE THE PULMONARY FUNCTION TESTS IN HYPOTHYROID FEMALES ATTENDING A TERTIARY CARE CENTRE – A CROSS SECTIONAL STUDY.

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ABSTRACT

Introduction: Hypothyroidism is a relatively common medical condition in general population. It is a multiorgan endocrine disorder which also results in respiratory muscle weakness and slow respiratory depression. Pulmonary Function Tests (PFT) using Spirometry is widely used non invasive, less expensive, easy to perform test. The purpose of the prospective study was to evaluate the pulmonary functions of the female patients diagnosed hypothyroidism.

Materials & Methods: Cross sectional study. PFT was performed using SPIROLAB II in sitting posture at Physiology Research Lab.

Results: There is statistically significant reduction in FVC, FEV1, and slight increase in FEV1/FVC. The lung function impairment showed restrictive pattern.

Conclusion: The simple non invasive easy interpretive method, spirometry can be tested regularly in hypothyroidism in their follow up to have an early evaluation of complications due to respiratory system. In future, the study would help to reduce the morbidity and improve the quality of these patients.

KEYWORDS: Pulmonary Function tests Hypothyroidism Females

INTRODUCTION

Hypothyroidism is a relatively common medical condition in general population all over the world. It is explained as a clinical disease which is a result from insufficient secretion of thyroid hormones from the thyroid gland either because of any structural or functional impairment or both¹. It most commonly affects females. The presentation to the clinical Outpatient Departments varies considerably. The variety of clinical manifestations includes fatigue, dryness of skin, weight gain, cold intolerance, constipation, menorrhagia, hoarseness of voice, loss of hair, lack of concentration, impairment of memory and neurologic signs appear after months to years².

BACKGROUND

Actually the respiratory system like any other organs of the body is also affected by the hypothyroid state, although the respiratory symptoms are seldom major complaints in hypothyroidism³. It is a multiorgan endocrine disorder which also results in respiratory muscle weakness and slow respiratory depression. The spectral array of symptoms range from mild breathlessness to severe life threatening respiratory failure⁴. Difficulty in weaning these patients from assisted ventilation⁵ is another significant idea to monitor their lung functions periodically during their follow up visits. Pulmonary Function Tests (PFT) using Spirometry is widely used non invasive, less expensive, easy to perform test.

AIM

The purpose of the prospective study was to evaluate the pulmonary functions of the female patients diagnosed hypothyroidism.

OBJECTIVE

The objective was to use spirometry as a tool to assess the lung functions of hypothyroid females.

MATERIALS & METHODS

This was a cross sectional study done in Department of Physiology in the Research laboratory. The sample was chosen by random sampling technique from the Medical Endocrine Outpatient Department. The sample size was 60.

Inclusion criteria: Females, Age 20 to 50 years, Thyroid function tests: serum TSH, free T4. TSH Value > 3.5 mU/L

Exclusion criteria: Goitre swelling with obstruction, any co morbid illness, especially respiratory diseases, smoking History, occupational history of dust exposure, terminally ill.

Institutional ethics committee clearance was obtained for the study. 30 Age matched healthy controls from Master Health Check Up were selected. The written and informed consent in their own language was taken before the study subjects entered the study. The complete

medical and family history was taken along with clinical examination also. Thyroid Function Tests were Free T3, T4 and TSH done in our hospital laboratory. The study subjects were made to rest and relax completely. Subjects were explained the method clearly and demonstrated, as the co operation and motivation influences the results. After explaining the technique of maximum inhalation followed by maximum exhalation, PFT was performed using SPIROLAB II in sitting posture at Physiology Research Lab with the nose clip held in position on the nose. All techniques of measurement, instruments maintained uniformly throughout the study.

Parameters:

The important measures of spirometer as Forced Vital Capacity (FVC), Forced Expiratory Volume in one second (FEV1), and FEV1/FVC were considered for our study in hypothyroid subjects and to compare with the controls.

RESULTS

All data were tabulated in Microsoft excel and statistical analysis were done by using SPSS software. Statistical analysis of the mean and standard deviation of parametric values were assessed using Student unpaired 't' test for thyroid function tests and respiratory parameters. The baseline characteristics of the study population are tabulated in table 1. There is no statistical significance in the anthropometric measurements. TSH values were significantly high in the hypothyroid females as in table 2. There is statistically significant reduction in FVC, FEV1, and slight increase in FEV1/FVC tabulated in table 3. The lung function impairment showed restrictive pattern.

Table 1: Baseline Characters of hypothyroid females compared with controls:

Variable	Control Subjects n = 30 Mean + SD	Hypothyroid Subjects n = 30 Mean + SD	P Value
Age (years)	35.65±6.53	39.70±8.27	0.15
Weight (kg)	56.20±8.12	66.33±10.14	0.12
Height (cm)	155.10±2.24	152.13±3.42	0.13
BMI (kg/m ²)	23.36±3.85	28.67±3.21	0.06

BMI = Body mass Index

* P < 0.05 is significant; student independent t test

Table 2: TSH levels of hypothyroid females compared with controls:

Lab Parameter	Control subject n = 30 Mean + SD	Hypothyroid Subjects n = 30 Mean + SD	P Value
TSH (μ IU/ml)	2.01 0.99	13.67± 10.22	0.001**

TSH – Thyroid Stimulating Hormone.

** P value < 0.05 is significant

Table 3: Spirometry Parameters of hypothyroid females compared with controls:

	Control Subjects n = 30 Mean + SD	Hypothyroid Subjects n = 30 Mean + SD	P Value
FEV1	2.88± 0.54	2.00± 0.45	0.001**
FVC	2.95± 0.56	2.01± 0.46	0.001**
FEV1/FVC	97.46 ±4.98	99.45± 1.72	0.01*

** P value < 0.05 is significant

DISCUSSION

Hypothyroidism is a common clinical disorder which occurs frequently in the population. The incidence of primary hypothyroidism is 2% in adult women and 0.3% only in adult men. Much research works have been done in neurological involvement of thyroid disorders especially its insufficiency. Few studies are focusing into the effects of hypothyroidism on respiratory and cardiovascular systems. We decided to explore on the respiratory functional impairment in thyroid insufficiency among the female population. The clinical presentation of hypothyroidism varies from person to person depending on their duration of disease, cause and degree of deficiency. There was evidence of both inspiratory and expiratory muscles strength decrease⁶, alveolar hypoventilation due to depression of hypoxic and hypercapnoeic ventilator drives^{7,8} and also reduction in maximum breathing, diffusing capacity⁵ in patients of hypothyroidism. These impairments are reversible with thyroid hormone replacement therapy.

With this background, our study was undertaken to evaluate PFT in hypothyroid females and compare with the healthy controls. In our study there was significant reduction in important lung function parameter FVC and FEV1 statistically which is in accordance to Cakmak et al observation⁹. It was confirmed that the hypothyroid patients develop diaphragmatic dysfunction, which can vary from mild forms of reduced physical tolerance to exertion to paralysis event to respiratory failure¹⁰. In the present study the FEV1/ FVC ratio was found to be statistically increased in value in hypothyroid females suggestive of a restrictive lung disease. Similar restrictive pattern was found in 53% of hypothyroid patients¹¹. In hypothyroid myopathy, there is slowness of muscle contraction and deep Tendon reflexes delayed in 85% patients. These hypothyroid subjects have decreased metabolic rate, reduction in rate of O₂ utilisation, hence reduced formation of CO₂ leads to depression of ventilatory drive¹². The neuromuscular symptoms present in 30% to 80% patients. Symptoms improve or disappear with correction of hypothyroid state.

Currently there is increased body weight in general due to change in culture, food habits and lifestyle. The respiratory infections more common than healthy people¹³, also complicates these lung functions of hypothyroid who have already increase in BMI.

DRAWBACKS

The controls should have been included into the study from the residing area of the hypothyroid female study subjects in order to limit the environmental conditions affecting the lungs. The duration of symptoms prior to diagnosis of hypothyroidism was not taken into consideration. Follow up has to be done and repeat PFT to correlate with the levels of thyroid hormones. There is plan in future to do PFT even when they become euthyroid¹⁴. The sample framing will be done again to continue the study.

CONCLUSION

There is definite impairment of lung functions in hypothyroid patients. Regular muscle strength assessment, any kind of sleep study¹⁵ or any invasive procedures are not ideal to be followed. The simple non invasive easy interpreted method, spirometry can be tested regularly in hypothyroidism in their follow up to have an early evaluation of complications due to respiratory system. A proper future study planned rectifying the possible limitations and to bring PFT as a screening test for hypothyroid patients.

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