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Assessment of pulmonary function tests among patients with hypothyroidism

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***Abstract*---**Background: The respiratory system involvement in hypothyroidism varies from mild dyspnea to a more severe respiratory failure. This has been reported as reduction in expiratory and inspiratory muscle strength, alveolar hypoventilation along with reduction of hypoxic and hypercapnic ventilatory drives and decreased maximal breathing capacity and decreased diffusion capacity among hypothyroid patients. Material & Methods: The present prospective study was conducted at department of respiratory medicine of our tertiary care hospital. In present study, we enrolled 50 study participants from outdoor and from ward by simple random sampling. Clearance from Institutional Ethics Committee was taken before start of study. Written informed consent was taken from each study participant Results In the present study, majority of patients showed obstructive pattern i.e. 30% which was followed by mixed pattern among 22% patients and 18% of patients showed restrictive pattern. 30% of patients showed normal respiratory pattern on pulmonary function test. On the basis of the Spirometry examination finding among case group, the mean value of FEV1 (L) was 1.38±0.68, the man value of FVC(L) was 2.24±0.71. on assessment the mean value of FEV1/FVC proportion (postbronchodilator) was 61.6 ±11.3. On the basis of the Spirometry examination finding among control group, the

mean value of FEV1 (L) was 1.91±0.88, the man value of FVC(L) was 2.96±0.89. on assessment the mean value of FEV1/FVC proportion (postbronchodilator) was 78.1±9.7. These differences were statistically significant (P value < 0.05). Conclusion: We concluded from the present study that among patients of hypothyroidism there was significant reduction in the lung functions on pulmonary function tests. There was statistically significant reduction observed on during the evaluation of pulmonary functions in these patients

***Keywords*---**hypothyroidism, spirometry, FEV1/FEV6 proportion.

Introduction

Thyroid disorders are endemic in mountainous hilly areas also seen in higher frequencies in non-mountainous hilly areas which are remotely situated from sea (1). The thyroid hormones control the metabolism of macromolecules, oxygen consumption and the basal metabolic rate (BMR) of body cells and are essential for normal growth and maturation of the body as well as they are essential for proper development of the peripheral and central nervous system (2). Thyroid gland is a butterfly shaped endocrine gland which is situated anatomically in the anterior aspect of root of the neck and comprises of two bulky lateral lobes which are connected by a thin isthmus (3). Thyroid gland secretes several hormones such as triiodothyronine (T3), thyroxine (T4) and calcitonin. Disorders of hormones produced by thyroid gland consists a group of commonly reported endocrinological disease. The prevalence and magnitude of all the thyroid disorders are associated and dependent on numerous risk factors and confounding factors (4).

Patients with thyroid lesions generally present to health facilities either as signs & symptoms of hyperthyroidism and hypothyroidism or as mass lesions. Histopathological evaluation is very deciding for Surgical excision and key-factor to establish diagnosis in the latter phase (5). The range of thyroid lesions are varied from congenital lesions to hyperplastic or metabolic goiter and inflammatory to neoplastic thyroid lesions. Pathologic evaluations of lesions of the thyroid gland are of research importance because they directly affect the functioning of other organs of body and along with that histopathological result forms the basis of highly effective medical and surgical treatment (6).

Hypothyroidism affects all organ, systems and metabolism of the body, including the respiratory system. It has been reported that the respiratory system involvement in hypothyroidism varies from mild dyspnea to a more severe respiratory failure. This has been reported as reduction in expiratory and inspiratory muscle strength, alveolar hypoventilation along with reduction of hypoxic and hypercapnic ventilatory drives and decreased maximal breathing capacity and decreased diffusion capacity among hypothyroid patients (7). The effect of hypothyroidism on respiratory system were reported as both obstructive and restrictive patterns in previous studies. Hence, We conducted the present study to evaluate and assess the pulmonary function tests among patients with hypothyroidism at our tertiary health care centre.

Materials and Methods

The present prospective study was conducted at department of respiratory medicine of our tertiary care hospital. The study duration was of six months from July 2019 to December 2019. A sample size of 50 was calculated at 95% confidence interval at 5% acceptable margin of error by epi info software version 7.2. Patients were enrolled from outdoor and from ward by simple random sampling. The study participants were further divided in two equal groups, group 1 consists of 50 newly detected hypothyroids and group 2 with 50 controls who were age, sex matched and from similar environment as the cases. Group 1 hypothyroid patients include both clinical and subclinical hypothyroidism patients. Institutional Ethics Committee Clearance was obtained before start of study and written and informed consent for the procedure was obtained from all the patients. Strict confidentiality was maintained with patient identity and data and not revealed, at any point of time.

Patients already on thyroxine therapy, history of smoking, BMI>23 kg/m2, known patients of respiratory or cardiac diseases and pregnant women were excluded from the study. All study participants were undergone a detailed clinical examination and routine investigations such as thyroid profile (TSH, fT3 fT4), spirometry and chest x ray. PFT is carried out in a quiet room in siting position with a nose clip. An average of 3 readings were taken. Spirometric parameters; Forced vital capacity (FVC), Forced expiratory volume in 1st second (FEV1), FEV1/FVC, Peak expiratory flow rate (PEFR), Forced expiratory flow 25%-75% (FEF25%-75%) were recorded. On follow up visit same data were recorded and compared. All the data was recorded on Microsoft excel spread sheet and data analysis was done at 10% alpha and 95% confidence interval using SPSS v22 software. Test of significance were applied on collected and organized data and p value less than 0.05 was considered as statistically significant association between study variables.

Results

In present study, we enrolled 50 study participants from outdoor and from ward by simple random sampling, who were presented with signs and symptoms of hypothyroidism. The age of study participants was ranged from 19 years to 60 years. The mean age of study participants was 36.4 years. Majority of the study participants 66 % were belonging the age group of 30-50 years which was followed by 18% study participants in the age group of 50-60 years which was followed by 16% study participants in age group of 18-30 years of age. Out of total study participants it was reported that females 68% were likely affected more than males 32% in the ratio of 2.12: 1. The mean BMI of study participants was 24.6±3.47. 50 controls were enrolled on the basis of age, sex matching and from similar environment as the patients. The mean TSH levels among cases was 30.6±10.9 and 4.1±1.3 among control group. The mean fT4 levels among cases was 0.69 ± 0.33 and 1.1 ± 0.28 among control group. (Table 1)

Table 1: Distribution of study subjects according to the age, gender and BMI

Study parameters	Number of subjects (%)

Age group	18-30 years	16%
	30-50 years	66%
	50-60 years	18%
Gender	Female	68%
	Male	32%
BMI (Kg/m2)	24.6±3.47	
TSH	Case group	30.6±10.9
	Control group	4.1±1.3
fT4	Case group	0.69±0.33
	Control group	1.1±0.28

In the present study, Pulmonary function test examination findings of total study participants were recorded. On the basis of the Pulmonary function test examination findings various respiratory patterns seen in cases, majority of patients showed obstructive pattern i.e. 30% which was followed by mixed pattern among 22% patients and 18% of patients showed restrictive pattern. 30% of patients showed normal respiratory pattern on pulmonary function test. (Table 2)

Table 2: Pulmonary function test examination finding wise distribution of study subjects

Study parameters	No. of cases
Obstructive pattern	30%
Restrictive pattern	18%
Mixed pattern	22%
Normal	30%

In the present study, Spirometry examination findings of total study participants were recorded. On the basis of the Spirometry examination finding among case group, the mean value of FEV1 (L) was 1.38±0.68, the man value of FVC(L) was 2.24±0.71. on assessment the mean value of FEV1/FVC proportion (postbronchodilator) was 61.6 ±11.3. On the basis of the Spirometry examination finding among control group, the mean value of FEV1 (L) was 1.91±0.88, the man value of FVC(L) was 2.96±0.89. on assessment the mean value of FEV1/FVC proportion (postbronchodilator) was 78.1±9.7. These difference were statistically significant (P value < 0.05). (Table 3)

Table 3: Spirometry examination finding wise distribution of study subjects

Study parameters	Case	Control	P value
	Mean±SD	Mean±SD	
FEV1(L)	1.38±0.68	1.91±0.88	< 0.05
FVC(L)	2.24±0.71	2.96±0.89	< 0.05
FEV1/FVC	61.6 ±11.3	78.1±9.7	< 0.05

In the present study, Spirometry examination findings of total study participants were recorded. On the basis of the Spirometry findings and values of TSH and fT4 levels we observed that there was no significant correlation between TSH or fT4 with FVC, FEV1, and FEV1/FVC on the basis of r value and p value. (Table 4)

Table 4: Distribution of subjects according to Correlation of TSH and fT4 with lung function parameters

Study parameters	TSH	fT4	P value
	r value	r value	
FEV1(L)	0.11	-0.16	>0.05
FVC(L)	0.19	-0.24	> 0.05
FEV1/FVC	-0.12	-0.01	> 0.05

Discussion

In present study, we enrolled 50 study participants from outdoor and from ward by simple random sampling, who were presented with signs and symptoms of hypothyroidism. The age of study participants was ranged from 19 years to 60 years. The mean age of study participants was 36.4 years. Majority of the study participants 66 % were belonging the age group of 30-50 years which was followed by 18% study participants in the age group of 50-60 years which was followed by 16% study participants in age group of 18-30 years of age. Out of total study participants it was reported that females 68% were likely affected more than males 32% in the ratio of 2.12: 1. The mean BMI of study participants was 24.6±3.47. 50 controls were enrolled on the basis of age, sex matching and from similar environment as the patients. The mean TSH levels among cases was 30.6±10.9 and 4.1±1.3 among control group. The mean fT4 levels among cases was 0.69 ± 0.33 and 1.1 ± 0.28 among control group. Similar results were obtained in a study conducted by Sivaranjani H et al among patients and reported that hypothyroidism causes significant reduction in FEV1 and FEV1/FVC ratio and reported obstructive patterns of lung involvement (8).

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present study that hypothyroidism causes significant reduction in FEV1, FVC and FEV1/FVC ratio (10).

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Conclusion

We concluded from the present study that among patients of hypothyroidism there was significant reduction in the lung functions on pulmonary function tests. There was statistically significant reduction observed on during the evaluation of pulmonary functions in these patients. However, for the generalization of present study results large multicentric studies required with larger sample size.

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