

Study of Pulmonary Function Test in Clinical Hypothyroidism patients in West Bengal

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Abstract

Clinical Hypothyroidism is defined as a clinical state resulting from insufficient secretion of thyroid hormone from thyroid gland due to some structural and/or functional impairments in thyroid hormone production (1,2). In practical field, biochemically if the serum fT_4 is below normal limit along with elevated TSH, it is designated as clinical hypothyroidism(2). It is a very commonly encountered clinical disorder in our community with a predisposition in female subjects with increasing age In Clinical Hypothyroidism, there is decreased muscle strength along with alveolar hypoventilation secondary to diminished response to hypoxic & hypercapnoeic ventilatory drives and this may affect Pulmonary functions accordingly(3). Objective: To assess Pulmonary Function in Clinical Hypothyroidism patients and to find out whether there is any significant impairment of lung functions.

Materials and Methods: The study was done in one of the Peripheral Medical Colleges of West Bengal, an eastern State of West Bengal. 100 subjects (50cases and 50 controls) were selected according to age, BMI. Inclusion and exclusion criteria. Serum TSH and serum fT_4 were measured and spirometric measurement of lung functions were done.

Statistical analysis was done by SPSS-17 and P value < 0.001 was considered as statistically significant.

Result: All the spirometric parameters were significantly decreased in Clinical hypothyroidism patients as compared with the normal control group.

Keywords: Clinical hypothyroidism, serum TSH, serum fT_4 , pulmonary function test.

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I. Introduction:-

Hypothyroidism is defined as a clinical state resulting from insufficient secretion of thyroid hormone from thyroid gland due to some structural and/or functional impairments in thyroid hormone production (1,2). In practical field, biochemically if the serum fT_4 is below normal limit along with elevated TSH, it is designated as clinical hypothyroidism (2,5). It is a very commonly encountered clinical disorder in our community with a predisposition in female subjects with increasing age(6). The incidence of clinical hypothyroidism is 2% in women and 0.2% in men(6).

Clinical hypothyroidism affects almost all of the organ systems and as such, presents with varied clinical symptoms & signs. They are mainly fatigue, weakness, dry & course skin, cold intolerance, swelling of the extremities, hair loss, lack of concentration & memory, constipation, weight gain, dyspnoea, hoarseness of voice, menorrhagia, diffuse alopecia, bradycardia, delayed relaxation of tendon reflexes and serous cavitory effusions (2,3,7). It has been reported in many studies that patients with clinical hypothyroidism have increased frequency of hyperlipidemia, diabetes, hypertension and increased cardiovascular risk compared with the euthyroid population (2,3,8). Pulmonary functions may get affected like other systems of the body, though respiratory manifestations are generally not major complaints (3,4). Clinical hypothyroidism can cause disorders of respiratory functions and disturbances of ventilation. Also, decreased muscle strength affects pulmonary function accordingly (3,4). Studies also shown that along with lung dysfunction and decreased lung capacity, low levels of thyroid hormone can trigger bronchial hyperreactivity and obstructive pulmonary disease(9,10). Hence this study was undertaken to assess pulmonary function in clinical hypothyroidism patients by evaluating spirometric parameters.

II. Materials and Methods:-

The study was cross-sectional. The study was done in one of the peripheral tertiary health care system in West Bengal. 100 subjects were selected in our study group from medicine OPD between the age group of 20 to 50 yrs. Among them 50 patients were with clinical hypothyroidism and the rest 50 were normal healthy

subjects. The 50 cases were selected from OPD with serum TSH value more than 6.16 mIU/ml and serum ft_4 value below 0.8 ng/dl. The 50 controls were selected with normal TSH and ft_4 values (TSH between 0.39 to 6.16 mIU/ml and ft_4 between 0.8 to 2 ng/dl).

BMI of both the groups were below 30 kg/m². History of smoking, any other respiratory illness and any other medical complications were taken as exclusion criteria of the study population.

After taking history, all the participants were clinically evaluated and their BMI was measured. Subjects with BMI between 24-30 kg/m² were included in our study group. Thyroid function test was done in the Department of Biochemistry by Enzyme Immuno Assay (EIA) using standard kit in autoanalyser TECAN ELISA Reader and Washer. Pulmonary function tests were done in Physiology Department using RMS Helios 401 Spirometer. Parameters chosen for pulmonary functions include FVC (L), FVC %, FEV₁, FEV₁ %, FEV₁/FVC %, FEF₂₅₋₇₅ (L), FEF₂₅₋₇₅ %, PEFR (L), PEFR %.

Statistical analysis was done by SPSS -17 and P value < 0.001 was considered statistically 'highly significant' while P value <0.05 was considered 'significant'.

III. Result:-

Table- 1 Demographic Features of Participants

		Control group (n= 50)	Clinical hypothyroidism (n= 50)
Age (years)		36.78 ± 4.62	38.60 ± 5.05
Gender	Female	31	34
	Male	19	16
Presence of Symptoms	Yes	0	42
	No	50	8

Table- 2 Thyroid Function Values of The Participants

	Control group (n=50)			Clinical hypothyroidism (n=50)		
	Mean	Standard Deviation	Standard Error	Mean	Standard Deviation	Standard Error
ft_4 (ng/dL)	1.4	0.26	0.04	0.57	0.12	0.02
TSH (μIU/ml)	2.12	0.62	0.09	50.77	22.84	3.48

Table- 3 Comparison of Spirometric Means between Clinical Hypothyroidism and Control Group of Subjects

	Control group (n=50)			Clinical hypothyroidism (n=50)			p-value	Significance level
	Mean	Standard Deviation	Standard Error	Mean	Standard Deviation	Standard Error		
FVC(L)	3.57	0.35	0.05	2.83	0.29	0.04	<0.001	HS**
FVC %	106.20	2.80	0.40	92.42	1.16	0.18	<0.001	HS**
FEV ₁ (L)	3.41	0.35	0.05	2.57	0.24	0.04	<0.001	HS**
FEV ₁ %	98.64	2.53	0.36	85.30	2.09	0.32	<0.001	HS**
FEV ₁ / FVC (%)	95.53	2.00	0.28	90.70	2.04	0.31	<0.001	HS**
FEF ₂₅₋₇₅ (L)	5.98	0.35	0.05	4.68	0.33	0.05	<0.001	HS**
FEF ₂₅₋₇₅ %	78.78	3.72	0.53	75.63	5.43	0.83	0.002	S*
PEFR(L)	5.94	0.39	0.06	4.63	0.32	0.05	<0.001	HS**
PEFR %	79.50	3.56	0.50	74.86	5.33	0.81	<0.001	HS**

Note: HS**= Highly Significant, S*=Significant, NS=Not Significant

IV. Discussion :-

Table 1 shows the demographic features of participants. Mean age of the participants were 38.6 ± 5.05 yrs and 36.78 ± 4.62 yrs in clinical hypothyroidism cases and controls, respectively. So, there was no significant difference between the groups regarding age. Among 50 clinical hypothyroidism cases, 34 participants were female and rest 16 patients were male. In the control group, there were 31 (62%) female subjects and 19 male subjects.

Table 2 shows the comparative values of fT4 and TSH between cases and controls. Mean serum fT4 values between cases and controls were 0.57 ± 0.12 ng/dl and 1.4 ± 0.26 ng/dl respectively. Mean serum TSH levels were 50.77 ± 22.84 mIU/ml and 2.12 ± 0.62 mIU/ml in cases and controls respectively. The difference of TSH level in cases and controls is highly significant ($p < 0.001$).

Table 3 shows the spirometric measurement of lung functions between cases and controls. The mean value of FVC (L), FVC%, FEV₁(L), FEV₁%, FEV₁/FVC%, FEF₂₅₋₇₅(L), FEF₂₅₋₇₅%, PEFR (L), PEFR % in clinical hypothyroidism cases were 2.83 ± 0.29 , 92.42 ± 1.16 , 2.57 ± 0.24 , 85.90 ± 2.09 , 90.70 ± 2.04 , 4.68 ± 0.33 , 75.63 ± 5.43 , 4.63 ± 0.32 and 74.86 ± 5.33 respectively whereas in the control group, the values are 3.57 ± 0.35 , 106.20 ± 2.80 , 3.41 ± 0.35 , 98.64 ± 2.53 , 95.53 ± 2.00 , 5.98 ± 0.35 , 78.78 ± 3.72 , 5.94 ± 0.39 and 79.50 ± 3.56 respectively. Here the spirometric parameters are definitely higher in the control group than the cases of clinical hypothyroidism. The differences of FVC (L), FVC%, FEV₁(L), FEV₁%, FEV₁/FVC%, FEF₂₅₋₇₅(L), PEFR (L), PEFR % are statistically highly significant

V. Conclusion:-

All the spirometric parameters are significantly decreased in clinical hypothyroidism patients as compared with healthy normal subjects. So, the respiratory system is highly affected in clinical hypothyroidism probably owing to decrease in inspiratory and expiratory muscle strength, alveolar hypoventilation secondary to diminished response to hypoxic & hypercapnoeic ventilatory drives and also probably due to bronchial reactivity. All these factors ultimately leads to diminished lung function comprising both restrictive & obstructive patterns which have been clearly delineated through spirometric values in this study. As clinical hypothyroidism patients are commonly found in general population, their pulmonary function should be properly evaluated and clinical management should be given at the earliest.

Limitation:-

The study would be better if our study population was larger and other measurements of pulmonary function like DL_{co} would have been done.

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