



“PATTERN OF VARIOUS LUNG VOLUMES IN PATIENTS OF HYPOTHYROIDISM”.

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ABSTRACT **BACKGROUND-** Hypothyroidism is one of the common endocrinal problem in our day to day clinical practice. Hypofunctioning of the thyroid affects although not severely the various lung volumes and capacities by number of mechanism which if diagnosed early as a complication can be addressed properly by making him euthyroid. **AIMS AND OBJECTIVES-** To assess the prevalence of different lung volumes abnormalities in patients of hypothyroidism. **MATERIALS AND METHODS-** A cross-sectional, observational study in which two hundred newly diagnosed patients of hypothyroidism were studied in GMC & hamidia hospital Bhopal which were divided into two subgroups overt(OH) and subclinical hypothyroidism(SH) among which the deviation of various lung volumes and capacities from normalcy was compared. **RESULTS-** In our study we found a decrement in FVC, FEV1, FEF_{25-75%} but these variables are still within normal limit for their age & sex except FVC which shows even less than 80%PPV. More number of patients in the OH have their FVC subnormal than in the SH group (51.11% versus 43.64%). No patient in either group shows any decreases in FEV1 or FEF_{25-75%} which is suggestive of the near normal airflow i.e. no obstructive lung disease which is further supported by normal or increased FEV1/FVC ratio in all patients. **CONCLUSION-** The study clearly shows a restrictive effect on lung volumes. There is no effect on airways so no results which are suggestive of obstructive pattern. By keeping these in mind we should evaluate a hypothyroid patient for these changes if he is having respiratory symptoms and vice-versa.

KEYWORDS : lung volumes, hypothyroidism, spirometry, OH, SH

INTRODUCTION:

Hypothyroidism is one of the most common endocrinal problem encountered in our clinical practice. The prevalence of hypothyroidism in Indian context is around 10.95% with significantly high proportion of females affected than males (15.86 versus 5.02%). Although it is uncommon for hypothyroid patients to be first presented with respiratory manifestations as hypothyroidism usually has an insidious onset and usually asymptomatic^[1]. But the effect of hypo functioning of the gland on depressed ventilatory drive (both hypoxic and hypercapnic), respiratory muscle weakness and alterations of lung volumes and capacities was studied in many of the previous studies. Skeletal muscle myopathy occurs with hypothyroidism^[2], in some past studies, the proportion of type 1 fibers of the diaphragm and intercostal muscles decreased four weeks after total thyroidectomy^[3]. Respiratory muscle strength is reduced in hypothyroidism and improves with treatment^[4]; weakness correlated with the degree of hypothyroidism^[5] and the reduction is caused by both a myopathy and neuropathy. Few studies have shown findings suggestive of restrictive pattern of impairment as reduction of the % predicted value of FVC, FEV1, FEF_{25-75%}, PEF_R among lung volumes. The rationale of this study to identify these complications in patients of hypothyroidism and by early intervention we can decrease morbidity due to them.

MATERIAL AND METHODS:

Current observational, cross-sectional study was conducted on 200 newly diagnosed hypothyroid patients came to medicine OPD, GMC and associated Hospital Bhopal. Based upon their symptoms, signs and relevant clinical examination all those suspicion of hypothyroidism and also met the inclusion criteria (not having previous confounding disease like asthma, COPD, diabetes, smoker, occupational exposure, any other lung disease on antithyroid drugs) ordered for T3, T4, TSH by ELISA. Those patients who had TSH value more than 5.5 microIU/ml have been selected and a written informed consent is taken about the participation in the study after which divided in two groups based on their thyroid profile. Patients having raised TSH (>5.5 microIU/ml) but normal T3 (0.8-2.1 ng/ml) and T4 (5-13 microg/dl) are considered subclinical hypothyroid and patients having raised TSH and T3 or T4 are considered overt hypothyroid.

Spirometry is performed by HELIOS-401 spirometer. The values of different parameters were expressed as PPV (percentage predictive value) for patient's age, sex, race, built etc. and categorisation was done on the basis of standard guidelines. The assessment used MS Excel 2007, MS word 2010 and statistical calculations were done by Epi-info 7 software. The variables were expressed using percentages and wherever necessary Mean \pm SD for quantitative data. The simple statistical test chi-square was performed for comparison between two groups and p-value less than 0.05 was taken as significant.

OBSERVATION AND RESULTS:

TABLE NO.1

| CHARACTER | OVERT HYPOTHYROIDISM PATIENTS (n=90) | SUBCLINICAL HYPOTHYROIDISM PATIENTS (n=110) | p - VALUE. |
|---|--------------------------------------|---|------------|
| Sex (M/F) | 19/71 | 20/90 | 0.7332 |
| Age (in years) | 36.82 \pm 7.94 | 36.53 \pm 7.10 | 0.4463 |
| BMI (kg/m ²) | 25.40 \pm 3.71 | 22.60 \pm 1.91 | 0.0000* |
| Forced vital capacity(FVC) | 81.33 \pm 12.33 | 82.50 \pm 11.89 | 0.3538 |
| Forced Expiratory volume in 1 sec, FEV1 | 87.61 \pm 5.81 | 88.09 \pm 6.24 | 1 |
| Forced expiratory flow (25-75%) | 88.20 \pm 5.75 | 89.05 \pm 5.61 | 1 |
| FEV1/FVC ratio | 109.14 \pm 10.82 | 107.23 \pm 10.29 | 0.6634 |

(*) shows statistically significant values; p<0.05.

Above table shows the spectrum of clinical variables of the patients in our study who were grouped among overt and subclinical hypothyroidism. The quantitative data are shown by Mean \pm SD (standard deviation) and the categorical data by the percentage (%). The significance is shown by p-value in the last column.

Table No.2 Distribution Of Patients By Forced Vital Capacity (FVC)

| Hypothyroid status | FORCED VITAL CAPACITY (% PREDICTED VALUE) | | | | | | TOTAL |
|--------------------|---|-----------|-----------|-----------|-------------------------|------------|------------|
| | 70-79 PPV | | 60-69 PPV | | Normal (80 or more PPV) | | |
| | Overt | 13.33% | 12 | 37.78% | 34 | 48.89% | |
| subclinical | 15.45% | 17 | 28.18% | 31 | 56.36% | 62 | 110 |
| TOTAL | | 29 | | 65 | | 106 | 200 |

Table No. 3 Distribution Of Patients By Forced Expiratory Volume (fev1)

| | Hypothyroid status | | FORCED EXP VOLUME IN 1 Sec. | | TOTAL |
|--------------|----------------------------|----------|-----------------------------|------------|------------|
| | Reduced (less than 80 PPV) | | Normal (80 or more) | | |
| | Overt | 0.00% | 0 | 100% | |
| subclinical | 0.00% | 0 | 100% | 110 | 110 |
| TOTAL | | 0 | | 200 | 200 |

Table No. 4 Distribution Of Patients By Fev1/fvc Ratio

| Hypothyroid status | FEV1/FVC Ratio | | | | TOTAL |
|--------------------|----------------|-----------|---------------|------------|------------|
| | 81-100 | | More than 100 | | |
| | Overt | 37.78% | 34 | 62.22% | |
| subclinical | 41.82% | 46 | 58.18% | 64 | 110 |
| TOTAL | | 80 | | 120 | 200 |

Table No. 5 Distribution Of Patients By Forced Expiratory Flow (fef25-75%)

| HYPOTHYROID STATUS | FORCED EXPIRATORY FLOW (FEF 25-75%) | | | | TOTAL |
|--------------------|-------------------------------------|-------|------------|------------|------------|
| | LESS THAN 80 PPV | | 80 OR MORE | | |
| | Overt | 0.00% | 00 | 100% | |
| Subclinical | 0.00% | 00 | 100% | 110 | 110 |
| TOTAL | | | | 200 | 200 |

DISCUSSION:

The prevalence of hypothyroidism in current study according to sex follows traditional pattern of female predominance in all 200 patients (80.50% female versus 19.50% male). But the distribution of sex between two groups is not statistically significant ($p=0.7332$). The mean age in OH is 36.82 ± 7.94 while in SH it is 36.53 ± 7.10 showing not much difference. Most SH patients (91.82%) having their BMI in normal range while a large fraction of patients (37.78%) in OH are overweight or obese. Multiple times in the past trials are made to assess the lung functions in the patients of hypothyroidism as due to myopathy and/or neuropathy, the respiratory muscles strength and airways affected^[5]. In a study conducted in RIMS, Imphal by Sharon Roel*, O. Punyabati et al. they found that hypothyroid subjects showed a reduction of the % predicted value of FVC, FEV1, FEF25-75%, PEFR as compared to control subjects even though these values are within the normal values for their age, sex and gender. But the difference is statistically significant only for FVC. And the % predicted value for FEV1/FVC of hypothyroid subjects is found to be significantly increased than the controls. Roel *et al.*^[6] also observed that both FVC and FEV₁ reduced in hypothyroid patients compared to control, but only FVC was significantly reduced. Same as in our study we found a decrement in FVC, FEV₁, FEF_{25-75%} but these variables are still within normal limit for their age, sex i.e. more than 80% PPV except FVC which shows even less than 80% PPV. More number of patients in the OH have their FVC subnormal than in the SH group (51.11% versus 43.64%). Based on the severity of decreases in FVC we grouped patients in mild (70-79PPV) & moderate (60-69PPV) degree of restrictive lung disease.

Out of 46 patients in OH who had their subnormal FVC, 12 has mild & 34 has moderate impairment whereas in 48 patients of OH group 17 had mild & 31 had moderate degree of lung volume impairment. No patient in either group shows any decreases in FEV₁ and FEF_{25-75%} which is suggestive of the near normal airflow i.e. no obstructive lung disease. The ratio of FEV₁/FVC is more than 100% (or 1) in most patients suggestive of decrement of FVC is more than decrement in FEV₁. But no variable of lung function (spirometric) shows any significant difference ($p > 0.05$) between the OH and SH group.

CONCLUSION:

This study shows that the different lung functions and volumes are

affected variably in hypothyroid state. There is no findings in this study suggestive of airway involvement rather only restrictive pattern is observed which is directly related with the severity of disease. So the chance of developing these complications should be kept in mind while dealing with a new case of hypothyroidism or during its natural history or if there is under-treatment state so that we can order spirometry and if comes to be abnormal can treat the condition (the hypothyroidism), hence the pathology will automatically remitted earlier before sufferings of patient increase. Also true is the vice-versa.

LIMITATIONS:

Cross sectional nature and small sample size was the main limitations of the present study. A further large case-control study has to be performed in the future to confirm the results of this present study.

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