Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(6), 1122-1125 | ISSN:2251-6727

Study of TSH Dysfunction Associated with Metabolic Disorders in adult Indian Population : A Clinical Prospective study

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(Received: 16 September 2024 Revised: 11 October 2024 Accepted: 04 November 2024)

KEYWORDS

Thyroid Function; Pulmonary Function Tests; Hyperthyroid; Hypothyroid

ABSTRACT:

Background:

Thyroid disorders rank among the most prevalent endocrine disorders worldwide. India is not an exemption either. All organ systems are impacted by thyroid diseases, which lower quality of life and increase long-term morbidity. Thyroid hormone changes have an impact on the respiratory system as well. They result in ventilation abnormalities respiratory disease & metabolic dysfunctions.

Aims and Objectives: In this study the pattern of metabolic dysfunctions to be observed with thyroid dysfunction.

Materials and Methods: We started this case-control observational study after receiving approval from the institutional ethical council. The study involved 100 individuals in total: 60 euthyroid controls and 40 thyroid problem patients (hypothyroid = 30 and hyperthyroid = 10). The study employed a convenient sampling technique, while the control groups were chosen using a basic random sample technique. The thyroid profile was then evaluated by using test device. Thereafter experiment has been performed and the data analysed by using SPSS version 20.0 (Chicago InL).

Results:

In euthyroids, hypothyroids, and hyperthyroids, the corresponding forced expiratory volume in 1 (FEV1)/forced vital capacity (FVC) was 81.73 ± 1.09, 82.16 ± 2.30, and 81.3 ± 1.75. FVC was 3.18 ± 0.63 in euthyroids, 2.66 ± 0.45 in hypothyroids, and 2.45 ± 0.36 in hyperthyroids. Patients with hypothyroidism exhibited a restrictive pattern, but hyperthyroid patients' PF did not differ significantly from those of euthyroid patients. For both hyperthyroid and hypothyroid patients, we discovered a positive linear relationship between FEV1 and TSH ($r = 0.52$ and $r = 0.17$, respectively).

Conclusion: In hypothyroid patients, our analysis reveals a restrictive pattern with elevated FEV1/FVC, while in hyperthyroid individuals, we were unable to identify any statistically significant variations in PFT.

INTRODUCTION

A collection of connected metabolic disorders known as metabolic syndrome are typified by central obesity, elevated triglycerides (TGs), decreased high-density lipoprotein cholesterol (HDL-C), hypertension, and hyperglycemia. Individuals who have metabolic syndrome are more likely to die from all causes, develop type-2 diabetes, and experience cardiovascular disease. Metabolic syndrome was linked to a higher ten year risk of coronary heart disease, even after controlling for putative risk variables and each component as a continuous variable [1]. The population-attributable rates of metabolic syndrome are measured between 5% and 6% for mortality from all causes, 10% and 14% for cardiovascular disease, and 32% and 54% for diabetes [2].The incidence rates of nutritional metabolic disorders, such as obesity, diabetes, and hypertension, have considerably increased in recent decades due to the expansion of the social economy [3]. According to an Indian survey, the frequency of metabolic syndrome has risen among Indian adults in recent years, and it is now a significant public health issue (4-7). Urban areas have a higher incidence of metabolic syndrome than rural ones, and

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the condition is generally more common as people age. The association between risk variables and the prevalence of metabolic syndrome exhibits variation based on gender (7,8). This process involves a number of important factors, including urbanization, economic growth, rising living standards, lifestyle adjustments, dietary modifications, and a decline in physical activity [4].

The control of metabolism is significantly influenced by the thyroid. Blood pressure management, energy consumption, and the metabolism of fats and carbohydrates are all impacted by thyroid hormones. According to recent research, individuals with subclinical and hypothyroidism were more likely to develop metabolic syndrome [9,10]. Prior research revealed that individuals with thyroid stimulating hormone (TSH) levels between 2.5 and 4.9 mU/L, which is the upper limit of the normal range, had higher rates of obesity, higher TG levels, and a higher risk of developing metabolic syndrome [11]. Even if TSH is within the normal range, healthy young women with levels > 2.5 mU/L should be assessed for the possibility of metabolic syndrome [12]. There was no significant correlation found in other reports between high TSH levels and metabolic syndrome [13]. Thyroid function is also affected by obesity. Obese individuals had a higher risk of both overt (RR=3.32) and subclinical (RR=1.52) hypothyroidism, according to a meta-analysis of 24 studies. There was also a significant link between obesity and an increased risk of hypothyroidism (RR = 1.86) [14,15]. Additional research in a representative large-sample population is necessary to fully understand this relationship. There is mounting evidence that thyroid dysfunction impacts blood pressure, body weight, and the metabolism of lipids and glucose. These factors are linked to a number of metabolic parameters and may trigger the onset or exacerbation of metabolic syndrome components [16].

This cross-sectional study looked at the relationship in an Indian population between thyroid dysfunction and metabolic syndrome.

MATERIALS AND METHODS

Study Design

The information was gathered by a four-stage random sampling process from the Thyroid Disease, Iodine Nutrition, and Diabetes Epidemiology project, which covered both urban and rural populations. Adult respondents had to meet the following requirements in order to be eligible: they had to be at least 18 yrs old, have lived in the target community for at least 5 yrs, have not used contrast agents or iodine in the preceding three months, and were not pregnant [17].

The survey included information on household salt consumption, smoking status, family income, education level, and personal and family histories of thyroid disease. Each individual provided fasting blood and urine, and during the 2-hrs oral glucose tolerance test, blood samples were obtained from subjects without a diagnosis of diabetes. The urine and serum samples were taken and kept in storage at -20°C. Following the inquiry and specimen collection, all samples were sent to the central laboratory, where they were tested for thyroid indices and concentration of urine iodine in a unified manner while adhering to cold chain regulations. On the spot, metabolic indices were found right away.

LAB TESTS

An automatic biochemical analyzer was used to measure the levels of serum TG, total cholesterol, low-density lipoprotein cholesterol (LDL-C), and high-density lipoprotein cholesterol (HDL-C), as well as fasting blood glucose (FBG) & 2-hrs blood. FT4 was tested when the TSH level above the upper margin of the reference range from (0.25–4.18 mIU/L). TSH levels below the lower bound of the reference range were used to quantify FT4 and free FT3. Inductively coupled plasma mass spectrometry.

After removing individuals who satisfied the exclusion criteria, 61,988 people were eventually included in the analyses out of the total 81,000 participants who were enrolled. The participant inclusion flow chart is displayed in. 83.9 % of participants, or 52,899 individuals, had normal thyroid function. In contrast, 348 patients had overt hyperthyroidism, 197 had subclinical hyperthyroidism, 583 had over thypothyroidism, and 8,526 had subclinical hypothyroidism. Specifically, out of the individuals with low TSH, seven have central hypothyroidism. As the euthyroid control group, 9,968 participants were chosen at random from the normal group in order to avoid the impact of variations in group sizes. The overall traits of individuals with varying thyroid function levels.

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Table 1: Estimation Between Case & Control Group				
Variables	**Euthyroid (*n*=60)**	**Hypothyroid (*n*=40)**	**Hyperthyroid (*n*=10)**	***P- Value***
Age (In Yrs)	32.47 ± 7.10	34.6 ± 8.48	30.23 ± 9.18	0.2226
Weight (In Kg)	55.36 ± 4.78	58.82 ± 10.57	51.36 ± 6.57	0.0002
Height (In cm)	155.48 ± 5.32	157.2 ± 7.81	157.12 ± 7.82	0.0918
BMI (In kg/m^2)	20.12 ± 1.92	21.86 ± 4.15	20.18 ± 4.29	0.0075

Table 2: TFT Between Case & Control Group				
Variables	**Euthyroid (*n*=60)**	**Hypothyroid (*n*=30)**	**Hyperthyroid (10)**	***P- Value***
TSH	2.91 ± 0.81	26.62 ± 18.98	0.45 ± 0.32	0.0000
fT3	5.33 ± 0.95	1.12 ± 0.58	22.17 ± 9.68	0.0000
fT4	11.62 ± 1.78	7.68 ± 2.65	45.3 ± 19.98	0.0000

Table 3: PFT Between Case & Control Group				
Variables	**Euthyroid**	**Hypothyroid**	**Hyperthyroid**	***P-Value***
FVC	3.27 ± 0.65	2.75 ± 0.51	1.99 ± 0.58	0.0002
FEV1	2.52 ± 0.59	2.42 ± 0.35	2.74 ± 0.45	0.0004
FEV1/FVC	81.78 ± 1.52	82.55 ± 2.75	83.3 ± 1.77	0.0781
PEFR	16.46 ± 77.65	6.48 ± 0.68	6.53 ± 0.58	0.6799

CONCLUSION

We found a restrictive pattern of pulmonary functions in hypothyroids whereas we could not find any significant changes in hyperthyroid patients.

REFERNCES

1. Misra A, Khurana L. Obesity and the metabolic syndrome in developing countries. *J Clin Endocrinol Metab* (2008) 93:S9–30.
2. Lu J, Wang L, Li M, Xu Y, Jiang Y, Wang W, et al. Metabolic Syndrome Among Adults in China: The 2010 China Noncommunicable Disease Surveillance. *J Clin Endocrinol Metab* (2017) 102:(2):507–15.
3. Gu D, Reynolds K, Wu X, Chen J, Duan X, Reynolds RF, et al. Prevalence of the metabolic syndrome and overweight among adults in China. *Lancet (London England)* (2005) 365(9468):1398–405.
4. Ford ES. Risks for all-cause mortality, cardiovascular disease, and diabetes associated with the metabolic syndrome: a summary of the evidence. *Diabetes Care* (2005) 28(7):1769–78.
5. Lao XQ, Ma WJ, Sobko T, Zhang YH, Xu YJ, Xu XJ, et al. Dramatic escalation in metabolic syndrome and cardiovascular risk in a Chinese population experiencing rapid economic development. *BMC Public Health* (2014) 14:983.
6. Xu S, Gao B, Xing Y, Ming J, Bao J, Zhang Q, et al. Gender differences in the prevalence and development of metabolic syndrome in Chinese population with abdominal obesity. *PloS One* (2013) 8(10):e78270.
7. Song QB, Zhao Y, Liu YQ, Zhang J, Xin SJ, Dong GH. Sex difference in the prevalence of metabolic syndrome and cardiovascular-related risk factors in urban adults from 33 communities of China: The CHPSNE study. *Diabetes Vasc Dis Res* (2015) 12(3):189–98.
8. Guarner-Lans V, Rubio-Ruiz ME, Pérez-Torres I, Baños de MacCarthy G. Relation of aging and

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(6), 1122-1125 | ISSN:2251-6727

sex hormones to metabolic syndrome and cardiovascular disease. *Exp Gerontol* (2011) 46(7):517–23.

9. Erdogan M, Canataroglu A, Ganidagli S, Kulaksızoglu M. Metabolic syndrome prevalence in subclinic and overt hypothyroid patients and the relation among metabolic syndrome parameters. *J Endocrinol Invest* (2011) 34(7):488–92.
10. Waring AC, Rodondi N, Harrison S, Kanaya AM, Simonsick EM, Miljkovic I, et al. Thyroid function and prevalent and incident metabolic syndrome in older adults: the Health, Ageing and Body Composition Study. *Clin Endocrinol* (2012) 76(6):911–8.
11. Ruhla S, Weickert MO, Arafat AM, Osterhoff M, Isken F, Spranger J, et al. A high normal TSH is associated with the metabolic syndrome. *Clin Endocrinol* (2010) 72(5):696–701. Oh JY, Sung YA, Lee HJ. Elevated thyroid stimulating hormone levels are associated with metabolic syndrome in euthyroid young women. *Korean J Internal Med* (2013) 28(2):180–6.
12. Garduño-Garcia Jde J, Alvirde-Garcia U, López-Carrasco G, Padilla Mendoza ME, Mehta R, Arellano-Campos O, et al. TSH and free thyroxine concentrations are associated with differing metabolic markers in euthyroid subjects. *Eur J Endocrinol* (2010) 163(2):273–8. Bakiner O, Bozkirli E, Cavlak G, Ozsahin K, Ertorer E. Are plasma thyroid- stimulating hormone levels associated with degree of obesity and metabolic syndrome in euthyroid obese patients? *A Turkish cohort study ISRN Endocrinol* (2014) 2014:803028.
13. Song RH, Wang B, Yao QM, Li Q, Jia X, Zhang JA. The Impact of Obesity on Thyroid Autoimmunity and Dysfunction: A Systematic Review and Meta- Analysis. *Front Immunol* (2019) 10:2349.
14. Liu YY, Brent GA. Thyroid hormone crosstalk with nuclear receptor signaling in metabolic regulation. *Trends Endocrinol Metab: TEM* (2010) 21(3):166–73.