

Estimating the Correlation between Autoimmune Thyroid Disorders and Chronic Spontaneous Urticaria: A Study Protocol

ABSTRACT:

BACKGROUND: Chronic spontaneous urticaria is thought to occur due to the patient's predilection to produce self-reactions. Urticaria contributes to loss of sleep, anxiety, depression, lack of motivation and social isolation, which may contribute to a substantial decrease in the patient's quality of life. Chronic spontaneous urticaria is unpredictable and can impair the patient's usual everyday activities. Autoimmune thyroid disorders are as a consequence of immune system dysregulation, that results in a thyroid invasion. A relationship between Chronic Spontaneous Urticaria and Autoimmune Thyroid Disorders is related to the duration and severity of the disease. Chronic Spontaneous Urticaria is associated with the presence of antithyroid antibodies. This study aims to analyze the changes in Patients detected with T3, T4, TSH and anti-TPO of chronic spontaneous urticaria, in contrast to normal healthy individuals and patients with other skin diseases which do not have abnormal thyroid etiopathogenesis.

MATERIALS AND METHODS: This will be a Case Control study conducted at Department of Dermatology, AVBRH, Sawangi, Wardha. Patients with chronic spontaneous urticaria will be subjected to a thorough clinical review and will be scored based on urticaria severity scoring. To test for autoimmune thyroid disease, the levels of T3, T4, TSH and anti-TPO antibodies will be traced. Data will be collected and analysed with appropriate statistical tests.

EXPECTED RESULTS: Statistical correlation between chronic spontaneous urticaria and autoimmune thyroid disorders which can aid in the early detection and arrest of progression of autoimmune thyroid disorders in chronic spontaneous urticaria.

CONCLUSION: Preventive steps toward patient management can be taken with this analysis in chronic spontaneous urticaria, in patients with deranged parameters for the T3, T4, TSH and ANTI – TPO.

KEYWORDS: Autoimmune disorders, Thyroid disorders, Urticaria, antibodies.

INTRODUCTION

Chronic spontaneous urticaria is thought to occur due to the patient's predilection to produce self-reactions.¹ Urticaria is a disorder induced by mast cells. Mast cells that are stimulated release histamine along with other mediators, such as platelet-activating factor and cytokines, resulting in activation of the sensory nerve, vasodilation, plasma extravasation. Different molecules eventually activate mast cells in urticaria, but these are generally not well known.²

Causes: Autoimmune diseases, urticarial vasculitis, thyroid autoimmunity, connective tissue disorders, infections etc. Chronic urticaria shows various clinical presentations. Urticaria is characterized by wheals. A wheal consists of common

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characteristics: 1) Variable size 2) itching ,central swelling. Lesions occur anywhere on the body, such as scalp, hands, soles. Wheals are itchy and patients rub rather than scratch on the lesions, due to which there are no excoriation signs. The related systemic symptoms of extreme urticaria can include headache, dizziness, hoarseness of speech, shortness of breath, nausea, vomiting and abdominal pain.³

Urticaria contributes to loss of sleep, anxiety, depression, lack of motivation and social isolation, which may contribute to a substantial decrease in the patient's quality of life. Chronic spontaneous urticaria is unpredictable and can impair the patient's usual everyday activities.⁴

Autoimmune thyroid disorders are a consequence of immune system dysregulation, that results in a thyroid invasion. They are T cell-mediated autoimmune disorders . Lymphocytic invasion of the thyroid parenchyma characterizes these diseases..⁵

The clinical hallmarks of autoimmune thyroid diseases include thyrotoxicosis or hypothyroidism. Epidemiological data suggested that interaction with the main factor that contributes to the breakdown of tolerance and the progression of the disease is genetic vulnerability and environmental causes.⁵

The significance of cytokines and chemokines in autoimmune thyroid disease pathogenesis has been shown in recent studies.⁵

T-helper 1 lymphocytes are responsible for increased development of IFN- γ and TNF-alpha, hence the secretion from thyroid cells of CXCL10 (IFN- γ -inducible Th1 chemokine prototype). This induces a feedback loop that initiates the autoimmune process.⁶

Association of chronic spontaneous urticaria and thyroid autoimmune disorder

There are several immunological pathways in common with autoimmune thyroid disorders and Chronic Spontaneous Urticaria. Such as immune system dysregulation, and decreased lymphocyte number.⁶ A relationship between Chronic Spontaneous Urticaria and Autoimmune Thyroid Disorders is related to the duration and severity of the disease. Chronic Spontaneous Urticaria is associated with the presence of antithyroid antibodies. As the occurrence of autoimmune thyroid disorders in patients with recurrent spontaneous urticaria is increased, tests for T3, T4, TSH and ANTI-TPO ANTIBODIES should be conducted as part of the approach .

RATIONALE:

The most common causes of dysfunction of the thyroid glands are Thyroid Autoimmune Conditions . Owing Interactions of environmental and genetic parameters, these conditions arise. Due to autoreactive lymphocytes that escape tolerance, they have reactivity to self-thyroid antigens. The process includes both cell-mediated and humoral responses that result in injury to the tissue⁷.

Chronic spontaneous urticaria involves activation and degranulation of mast cells and basophils. These are the basic mechanisms. As primary effectors of chronic urticaria, mast cells are the most prominent. Other forms of cells include lymphocytes, and the inflammatory infiltrates . Histamine and other mast cell products have been shown to be

the primary causes of the development of this disease. Elevated vascular permeability is its unique manifestations of urticaria. This results from the release of mediators of mast cells (e.g. histamine, tryptase, leukotriene) and the synthesis of cytokines. The pathogenesis of chronic urticaria includes two main mechanisms. The first involves dysregulation in mast cells and basophils of intracellular signaling pathways that causes defects in the functioning of these cells. The second requires the manufacturing of antibodies⁸

Chronic urticaria hence includes autoantibodies. It is distinguished by erythematous wheals and a minimum redness of at least 6 weeks present twice a week. There is a highly studied correlation between chronic urticaria and autoimmune conditions such as autoimmune thyroid diseases..⁸

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Hence, increased incidence of autoimmune thyroid diseases in chronic spontaneous urticaria patients can be expected.

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With this study we aim to analyze the changes in Patients detected with T3, T4, TSH and anti-TPO of chronic spontaneous urticaria, in contrast to normal healthy individuals and patients with other skin diseases which do not have abnormal thyroid etiopathogenesis. Identification of such association between chronic spontaneous urticaria and thyroid autoimmune disorders at an earlier stage would enable us to take necessary preventive measures minimizing the burden of the disease.

AIM AND OBJECTIVES

AIM: To study the auto immune thyroid disorders in chronic spontaneous urticaria.

OBJECTIVES:

The primary goals of this research are:

1. To research the clinical characteristics of chronic spontaneous urticaria.
2. T3, T4, TSH and ANTI-TPO ANTIBODIES analysis in chronic spontaneous urticaria patients and controls
3. To study the correlation between the above parameters and chronic spontaneous urticaria
4. To study the correlation between severity of chronic spontaneous urticaria and autoimmune thyroid disorders.

MATERIALS AND METHODS

Ethical approval: From The institutional ethics committee (ICE) , ethical approval will be received and Informed written consent from the enrolled individuals involved in the research.

Study Design- Case Control

Duration of study- October 2020 to September 2022

Place of study- Department of Dermatology, Leprosy, and Venerology DMIMS (Deemed to be University), Wardha.

Requisite time for collecting data: 2 years

Study setting: All patients over 18 years of age, regardless of sex, suffering from chronic spontaneous urticaria, admitting to the Department of Dermatology, Venereology and Leprosy of the Rural Hospital of Acharya Vinoba Bhave, Sawangi, Wardha, Maharashtra

Sample size:

$$n = \frac{Z_{\alpha/2} \cdot P \cdot (1-P)}{d^2}$$

$$n = (1.96)^2 \cdot 0.01 \cdot (1-0.01) / (0.05)^2$$

$$n = 15.21$$

n = 20 patients needed in each group in the study. (20 cases + 20 controls)

where,

n = sample size

$Z_{\alpha/2}$ is the level of significance at 5%, that is, 95% .Confidence interval is 1.96

P = Prevalence of chronic spontaneous urticaria= 1 % = 0.01

D = desired error of margin = 5% = 0.05

For the present analysis, the sample size will be 20 cases and 20 controls.

- **Cases** Any patient over the age of 18 years, regardless of gender, coming to the Department of Dermatology, Venereology and Leprosy and having chronic spontaneous urticaria.
- **Controls** will be normal healthy adult individuals of comparable age and gender ,and patients having skin diseases which do not have any abnormal thyroid etiopathogenesis

INCLUSION CRITERIA:

- Patients of both sexes over the age of 18 years.
- Patients who are with informed consent to take part in the study
- Patients having chronic spontaneous urticaria will be included
- Patients with other skin diseases who do not have any abnormal thyroid etiopathogenesis.

EXCLUSION CRITERIA:

- Patients having any major systemic disease/uncontrolled medical or surgical illness
- Patients having any renal or hepatic disorder.
- Patients with pregnancy or on lactation.

METHODOLOGY: Study will be conducted in Dermatology, Venereology and Leprosy Department, AVBRH, Sawangi, Wardha,

Patients having chronic spontaneous urticaria after considering the different inclusion and exclusion requirements, those who will come to the Department of Dermatology,

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Venerology and Leprosy, AVBRH, Sawangi, Wardha, will be enrolled. Clearance will be sought from the Institutional Ethical Committee (IEC). All participants will obtain written informed consent in their vernacular language for voluntary participation. A comprehensive history will be taken with regard to name, age, gender, family history, past history. Patients with chronic spontaneous urticaria will be subjected to a thorough clinical review. Patients will be scored based on urticaria severity scoring.

Table 1. urticaria severity scoring

SCORE	WHEELS	PRURITUS
0	NONE	NONE
1	MILD (<20 WHEELS /24HOURS)	MILD (PRESENT BUT NOT ANNOYING OR TROUBLESOME)
2	MODERATE (20 -50 WHEELS / 24HOURS)	TROUBLESOME BUT DOES NOT INTERFERE WITH SLEEP
3	INTENSE (>50 WHEELS / 24HOURS OR LARGE CONFLUENT AREAS OF WHEELS)	SEVERE PRURITUS,WHICH IS SUFFICIENTLY TROUBLESOME TO INTERFERE WITH NORMAL DAILY ACTIVITIES OR SLEEP

Autoimmune thyroid disorders will be screened by taking blood sample (both cases and controls) with all the standard protocols from the peripheral intravenous route {cubital vein } and pouring the blood sample into the respective blood tube . The blood sample is processed by V5600 DRY CHEMISTRY for T3 ,T4,TSH . ANTI-TPO ANTIBODY is processed by ELISA

To test for autoimmune thyroid disease, the levels of T3, T4, TSH and anti-TPO antibodies will be traced.

Comment [DM6]: Change this to 'will be processed'

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Comment [DM8]: Merge this with the previous sentence

<u>Parameter</u>	<u>Normal range</u>
Serum T3(Triiodothyronine)	0.970-1.69 ng/ml
Serum T4 (Thyroxine)	5.53-11.0 µg/dl
Serum TSH (Thyroid Stimulating Hormone)	0.465-4.68 µIU/ml

ANTI – TPO ANTIBODY : < 34 IU/mL (negative) >34 IU/mL (positive)

OUTCOME MEASURE

With this report, preventive steps may be taken in patient care with chronic spontaneous urticaria and in patients with deranged parameters, an assay for T3, T4, TSH and ANTI-TPO. Further, this can facilitate the early detection and arrest of progression of autoimmune thyroid disorders in chronic spontaneous urticaria. If there are any derangements in the T3, T4, TSH and anti-TPO, further referrals may be provided for the care of the patient.

STATISTICS

Statistical methods can analyze both standard parametric and non-parametric information.

A 'p' value of <0.05 will be considered significant

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SCOPE

This research would help to screen patients with chronic spontaneous urticaria for autoimmune thyroid disorders. It can later be considered as a mandatory protocol to be assessed in patients of chronic spontaneous urticaria.

EXPECTED RESULTS:

This research will take preventive steps to treat patients with chronic spontaneous urticaria and in patients with deranged parameters, an assay for T3, T4, TSH and ANTI-TPO can be done. Further, this can facilitate the early detection and arrest of progression of autoimmune thyroid disorders in chronic spontaneous urticaria.

Comment [DM10]: How? And not part of the primary goals?

DISCUSSION AND CONCLUSION:

O'FARRILL-ROMANILLOS et al, in the year 2019, investigated that in up to 54 percent of the individuals taken in the study, there is association of Chronic Spontaneous Urticaria (CSU) with thyroid disease in Men and women over the age of 18 with CSU were included in this study; TSH and T3 T4 were quantified. They were graded as euthyroid, hyperthyroid, and hypothyroid according to the results; Antithyroid antibodies have been observed. Demographic and biochemical features of the findings were relevant. More than a third of the patients analysed with chronic spontaneous urticaria had thyroid dysfunction.⁹

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Magdalena Czarnecka-Operacz et al, in the year 2017, Chronic urticaria (CU) has been studied to be a skin disease induced by autoantibodies. It is distinguished by a minimum of 6 weeks, twice a week, of hives, erythematous wheals and redness. A significant correlation is found between chronic urticaria and autoimmune disorders. The research included one hundred and forty-eight Chronic Spontaneous Urticaria patients. It measured presence of the concentrations of anti-TPO, TSH, T3 and T4. The findings showed that anti TPO levels in patients with Chronic Urticaria were much higher. Conclusions: There is a statistically important disparity between patients of chronic urticaria and the entire population in the presence of autoimmune thyroid disorder.¹⁰

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Collet E et al, in the year 1995, Study of the relationship Chronic urticaria was carried out for autoimmune thyroid disorders. METHODS AND PATIENTS: There were 45 patients with chronic urticaria in this study (29 men and 16 women, mean age 45.6 years). Both were clinically tested for thyroid disease with TSH, T3 and T4, and assays of anti-TPO antibodies. RESULTS: Most of the patients had autoimmune thyroid disorders.. DISCUSSION: These

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findings indicate that in patients with chronic urticaria, a full thyroid analysis with thyroid hormone assay should be performed. The most sensitive and specific tests in patients with autoimmune thyroid disorder tend to be the anti-TPO antibody.¹¹

Diego S Fernandez Romero et al, in the year 2005, studied that Chronic urticaria, Distinguished by the appearance of hives or angioedema lasting more than 6 weeks, is a common pathology. It functions as an autoimmune disease in a large number of patients, often due to changes in functioning of thyroid and thyroid antibodies. A sequential series of 70 patients diagnosed with chronic urticaria was identified in the study. In the 63 patients, thyroid function and thyroid antibodies were analyzed by measuring thyroid hormone level and anti-TPO levels. Out of 61 patients screened for anti-TPO antibodies, 22 (36 percent) reported positive. Studying thyroid function and the presence of anti-TPO antibodies in patients with chronic urticaria seems clinically important, given the high percentage of thyroid changes in some patients.¹²

A G Palma-Carlos et al in 2005, the aim of the research was to evaluate thyroid autoimmunity and thyroid function in chronic urticaria (CU). Evaluation of ANTI-TPO antibodies and TSH, T3, T4 with chronic spontaneous urticaria and without chronic spontaneous urticaria in 56 subjects in a matched control group was done. In 13, Anti-TPO was positive (22.2 percent). In 52 patients, thyroid function was normal, TSH increased in 2 patients, and T3 decreased in 1. In most circumstances, Chronic Spontaneous Urticaria is associated with thyroid autoimmunity. In all cases of chronic urticaria, thyroid anti-TPO and T3, T4, TSH must be tested.¹³ Few of the related studies were reported¹⁴⁻¹⁶. Studies on thyroid dysfunction were reported by Jose et. al.¹⁷, Raniwala et. al.¹⁸, Taksande et. al.¹⁹ and Agrawal et. al.²⁰. Shivkumar et. al. reported on prevalence of oral mucosal lesions in patients with dermatological diseases²¹. Gupta et. al. reported a study on Efficacy of some Ayurvedic formulations with special reference to urticaria²²⁻²⁶.

LIMITATIONS

- This is a study focused on hospital, not a study based on the population.
- The other autoimmune thyroid disorders markers are not taken example anti TSH receptor antibody and thyroglobulin antibody

IMPLICATIONS

Preventive steps toward patient management can be taken with this analysis in chronic spontaneous urticaria, in patients with deranged parameters for the T3, T4, TSH and ANTI – TPO. Further, this can facilitate the early detection and arrest of progression of auto immune thyroid disorders in chronic spontaneous urticaria patients.

NOTE:

The study highlights the efficacy of " Ayurvedic formulations " which is an ancient tradition, used in some parts of India. This ancient concept should be carefully evaluated in the light of modern medical science and can be utilized partially if found suitable.

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UNDER PEER REVIEW