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Original Article

Biochemistry Section

A Study of Thyroid Profile in Patients with Psoriasis

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ABSTRACT

Introduction: With a prevalence of 2% in Europe and North America, psoriasis is a common disease, showing a linear increase of prevalence over time, with prevalence at the age of 18 years comprising around 1%. Associated with several comorbidities, endocrine disturbances play an important role in the pathogenetic mechanisms and progression of psoriasis.

Aim: To study the association between thyroid hormone levels and incidence of psoriasis.

Materials and Methods: Total 135 psoriatic patients (62 males and 73 females) and 111 age and sex matched healthy controls were selected for the study. Thyroid hormone levels such as free T3, free T4 and TSH were evaluated by chemiluminescence assays.

Results: Mean age of control group was 47±2 years and the psoriatic group was 48±1.5 years. Incidence of the disease was higher in females compared to males. In males 6 (9.6%) were hypothyroid, 55 (88.7%) euthyroid and 1 (1.6%) was hyperthyroid whereas, in females 7 (9.5%) were hypothyroid, 63 (86.75%) euthyroid and 3 (4.1%) were hyperthyroid

Conclusion: Thyroid disorders are common in psoriasis. Several hormones including thyroid hormones and Corticotropin-Releasing Hormone (CRH) are involved in the pathophysiology of psoriasis. Evaluation of thyroid hormone levels and initiation of pharmacological intervention at the earliest when required may prevent worsening of the disease and associated comorbidity.

Keywords: Autoimmune disease, Inflammation, Thyroid hormones, Thyroid receptors

INTRODUCTION

Psoriasis is a common autoimmune disease of the skin that affects not only adults but also paediatric population. Psoriasis is a prototypical T-cell mediated inflammatory disease characterized by activation of Antigen Presenting Cells (APCs) and activation and expansion of Th-1 and Th-17 cells. A moderate to large negative impact of the disease on the quality of life with an alteration of everyday activities was reported by a National Psoriasis Foundation survey in about 75% of patients with psoriasis [1]. Psoriasis is a common disease, especially in Europe and North America with a prevalence of around 2% [2]. The prevalence shows a linear increase over time, with a prevalence of around 1 % at the age of 18 years. Psoriasis has been associated with insulin resistance, thyroid dysfunction, cardiovascular disease, atherosclerosis, Crohn's disease, depression, skin cancer and non-alcoholic fatty liver disease (NAFLD) [3-5]. Skin is the site of synthesis and metabolism of several neuropeptides including components of the Hypothalamic-Pituitary-Adrenal (HPA) and Hypothalamic-Pituitary-Thyroid (HPT) axis and also a source of vitamin D [6]. Any derangement of these axes may lead to or may be an indicator of various skin diseases. Neuropeptides and hormones synthesized in the skin not only act locally in paracrine or autocrine fashion but may also diffuse to the blood or activate dermal nerve endings and thereby influence central organs including the brain. Since, thyroid hormone receptors are expressed in human skin, and the hormones exert their effects on epidermal proliferation and differentiation, they have been hypothesized to play a role in the pathogenesis of psoriasis [7]. Genetic, environmental, immune defect and hormonal factors take part in the pathogenesis of autoimmune diseases. The role of various hormones like thyroid stimulating hormone, cortisol, prolactin and thyroid hormones in pathogenesis of psoriasis has been studied previously [8,9]. Severity of the disease has been correlated with levels of thyroid hormones, since like prolactin, the thyroid hormone receptors are expressed in the skin [10] and their levels change during the active phase of disease and alleviation of the disease by anti-thyroid therapy [11]. Cortisol is involved in the mediation of psycho-emotional stress, and cortisol response to stress is diminished in psoriasis as shown by Evers and colleagues [12]. In this study, we have investigated the prevalence of thyroid disorders in patients suffering from psoriasis.

MATERIALS AND METHODS

In this hospital based cross-sectional study, a total of 246 people in the age group 18-70 years were included after

obtaining ethical clearance from the Institutional Ethical Committee. Individuals attending the Dermatology Out-patient Department of SDM College of Medical Sciences and Hospital Sattur, Dharwad, India, were selected. Written informed consent was obtained from all participants of the study. Total 135 patients (62 males and 73 females) with physician diagnosed mild psoriasis (defined as percentage of body surface area (BSA) ≤10), were selected as study group and 111 age and sex matched healthy individuals (60 females and 51 males) were selected as controls. Exclusion criteria for participants of the study consisted of the following conditions: consumption of drugs that affected thyroid hormone levels (phenothiazines, H2 blockers, anti-depressants, butyrophenones, antipsychotics, oestrogens, reserpine, methyldopa, metoclopramide, verapamil, etc.,), pregnancy or lactation, menstrual abnormalities, any condition that could interfere with the evaluated hormone levels like pituitary, hypothalamic, adrenal or renal diseases, head trauma, and any malignancy or psychiatric or physical condition that could hamper participation in the study.

Five milliliters of fasting blood sample was collected under aseptic conditions from the individuals, centrifuged and immediately analysed or stored at -20°C. Total Cholesterol (TC) was estimated by cholesterol oxidase peroxidase method, Low Density Lipoprotein Cholesterol (LDL C) and High Density Lipoprotein Cholesterol (HDL C) by direct methods, and Triglycerides (TGs) by glycerol phosphate oxidase peroxidase method. All estimations were carried out on auto-analyser (Siemens dimension RxL Max). Thyroid profile consisting of free tri-iodothyronine (FT3), free thyroxine (FT4) and Thyroid-Stimulating Hormone (TSH) was estimated by chemiluminescence assay on Siemens Centaur CP. Because >99% of T4 and T3 in the blood are bound to serum proteins, but only the free thyroid hormones are biologically active, estimates of free thyroid hormone concentrations are theoretically preferable to total T3 and total T4 tests.

According to the serum TSH levels, participants were classified as having hypothyroidism (>5.5 mIU/L), euthyroid status (0.4–5.5 mIU/L) and hyperthyroidism (<0.4 mIU/L).

STATISTICAL ANALYSIS

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) Software, Version 20. Student-unpaired t-test was calculated to determine significance of the results obtained.

The level of significance based on p-value is as follows:

$p > 0.05$ – Non-significant

$p < 0.05$ – Significant

$p < 0.01$ – Highly significant

RESULTS

The demographic data of the study population is presented in [Table/Fig-1]. In our study population, the mean age of control group was 47±2.0 years and the psoriatic group was 48±1.5 years. Incidence of the disease was higher in females compared to males [Table/Fig-2]. [Table/Fig-2] also shows the distribution of cases according to TSH levels into hypothyroid, euthyroid and hyperthyroid groups. The relationship between thyroid hormones (FT3, FT4 and TSH) and psoriasis is shown in [Table/Fig-3].

	Controls	Cases
Age (Years)	47±2.0	48±1.5
Males	51	62
Females	60	73
SBP (mmHg)	128±1.1	126±1.2
DBP (mmHg)	88±1.1	90±0.9
Total Cholesterol (mg/dl)	178±5.8	166±6.4
HDL-C (mg/dl)	42±2.1	42±3.4
LDL-C (mg/dl)	142±4.5	148±4.9

[Table/Fig-1]: Demographic data of study population.

	Hypothyroid	Euthyroid	Hyperthyroid
Females (n=73)	7 (9.5%)	63 (86.3%)	3 (4.1%)
Males (n=62)	6 (9.6)	55 (88.7%)	1 (1.6%)

[Table/Fig-2]: Prevalence of thyroid disorders in psoriasis patients.

	CONTROLS	Euthyroid CASES	p-value
FT3 (pg/ml)	2.97±0.69	3.12±0.98	0.30
FT4 (ng/dl)	1.1±0.24	1.3±0.4	0.07
TSH (μIU/ml)	3.5±1.3	2.6±1.1	0.52

[Table/Fig-3]: Thyroid hormone levels in euthyroid psoriatic patients.

DISCUSSION

Our objective was to evaluate the relationship between the disease and thyroid hormone levels in patients diagnosed with psoriasis. Incidence of the disease was higher in females compared to males. In males 6 (9.6%) were hypothyroid, 55 (88.7%) euthyroid and 1 (1.6%) was hyperthyroid whereas in females 7 (9.5%) were hypothyroid, 63 (86.75%) euthyroid and 3 (4.1%) were hyperthyroid. No significant difference was noted in the values of FT3, FT4 and TSH hormones in the values among the control group and patient group. This could be attributed to the small sample size. These findings are similar to a study by Robati RM et al., who did not observe any statistically significant difference in the mean T3, T4 and TSH levels between psoriatic patients and controls [7]. Arican O et al., also observed no differences in serum levels of total T3, free T4 and TSH between cases and controls [8]. Though, a few studies have shown high prevalence of thyroid autoimmunity in patients with psoriatic arthritis, Gul U et al., did not find any statistically significant differences in the levels of anti-thyroglobulin and anti-thyroid peroxidase antibodies [13]. T3 has a major role in the regulation of cell growth and

differentiation [14]. T3 and T4 have hyperproliferative effect on the skin by Epidermal Growth Factor (EGF). Since, T3 receptors exist on the skin, it is postulated that T3 hormone may play a role in the synthesis of keratin. Propylthiouracil, an anti-thyroid drug, may interfere with keratin synthesis by binding to nuclear T3 receptors [15]. One of the factors for the induction of autoantibodies in psoriasis might be the unique neo-epitopes generated by structural alterations in albumin and thyroid antigens by Reactive Oxygen Species (ROS) [16]. No statistical difference was observed in the thyroid gland functions between the psoriatic patients and controls in a study by Zoabi A et al. In another study compared to patients with mild psoriasis, patients with severe psoriasis demonstrated increased TSH levels and positive autoantibody titres [17]. A significantly higher prevalence of thyroid autoimmunity (positive AbTPO, hypoechoic thyroid) was observed in men and women with psoriatic arthritis and of sub-clinical hypothyroidism in women with psoriatic arthritis than in the general population [4]. Clinical diabetes characteristics when studied in psoriasis patients were clearly worse compared to patients without psoriasis. Prevalence of comorbid conditions and depression were higher and more aggressive diabetes therapy was required [18]. The analysis of the U.S. National Health and Nutrition Examination Survey database [19] revealed that patients with thyroid diseases had a significantly increased risk of having psoriasis. But after adjusting for confounding variables, this association was not significant. Levels of TSH in patients with active psoriasis were significantly lower than those without active disease. A high risk of having psoriasis was correlated with an increase in thyroid function, although this relationship was not significant. Physiological response to stress in healthy individuals is different from that in patients with psoriasis, as demonstrated by alterations in the HPA axis and sympathetic–adrenal–medullary system function. Psychological stress results in a redistribution of leucocytes with increased trafficking of inflammatory cells into the skin, which may exacerbate psoriasis [20]. The chronic inflammatory nature of psoriasis may predispose to an association with other inflammatory diseases, especially cardiovascular diseases and metabolic disorders. Prevalence of cardiovascular comorbidities and cardiovascular risk according to the Framingham risk score were both increased in patients with psoriasis [21]. The risk of obesity and metabolic syndrome was increased in psoriasis but no consistency was found across studies for diabetes, hypertension and dyslipidaemia [22]. Acute stress leads to increased skin vascular permeability and inflammation through mast cell activation by Corticotropin-Releasing Hormone (CRH) both in rodents and humans as shown by Crompton and colleagues [23]. Other hormones like CRH are hypothesized to be involved in the pathophysiology of skin diseases since CRH and CRHR-1 are both expressed in human skin [24]. Several other hormones influence the clinical manifestations of psoriasis, including glucocorticoids, epinephrine, thyroid hormones, and insulin although sex hormones and prolactin have a major role in psoriasis pathogenicity [25]. A change in thyroid hormone levels has been reported during the active phase of psoriasis and an improvement in psoriasis was seen in patients with hyperthyroidism [7,8]. Antithyroid medications such as propylthiouracil have proven effective in treating psoriasis suggesting that there may be an association between psoriasis and thyroid function [26].

LIMITATION

The study can be duplicated on a large sample size and the levels of Total T3 and Total T4 can be studied along with anti TPO antibodies.

CONCLUSION

Psoriasis is a chronic systemic inflammatory disorder associated with various endocrine dysfunctions. From our observations we conclude that the prevalence of thyroid disorders in psoriatic patients is high although no statistically significant difference was noted in the levels of thyroid hormones between healthy individuals and patients with psoriasis. Patients need to be screened for thyroid abnormalities and thus prevent worsening of the disease course. Further studies need to be carried out on a larger patient population to ascertain statistical significance.

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