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Dyslipidemia and Thyroid Dysfunction Associated with Psoriasis

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ABSTRACT

Background: Psoriasis is a T-cell mediated inflammatory skin disorder which causes considerable psychosocial disability resulting in major impact on patient's quality of life. The dominant response of Th1 cells and the high expression of related inflammatory factors appears in both psoriasis and thyroid dysfunction. Psoriasis can lead to increased risk of incidence of cardiovascular events for which dyslipidemia is an important risk factor. This study aims to evaluate thyroid function and lipid profile and its association in patients with psoriasis.

Methods: This was a prospective case-control study conducted at the Department of Biochemistry, Nobel Medical College Teaching Hospital from November 2021 to October 2022. Seventy six clinically diagnosed psoriatic patients were taken as case and eighty non-psoriatic patients coming for other skin lesions were included in the study as control. Thyroid function test (serum free T3, T4, TSH) and lipid profile (total cholesterol, low density lipoprotein, high density lipoprotein and triglyceride) were done.

Results: Hypothyroidism was most common thyroid abnormalities in our study population which was 13.15% (n=10). The lipid profile parameters were significantly higher in the psoriatic patients than in the controls ($p<0.001$). The odds of psoriatic patient having thyroid dysfunction was 2.8 times higher compared to other non-psoriatic patients and the odds of psoriatic patient having dyslipidemia was 8.7 times higher compared to other non-psoriatic patients.

Conclusions: It is thus useful to assess thyroid function test and lipid profile in patients with psoriasis considering their role in etiopathogenesis and co-morbidity of psoriasis.

Keywords: Co-morbidity; dyslipidemia; thyroid dysfunction

INTRODUCTION

Psoriasis is a common relapsing autoimmune skin disease with a complex pathophysiology and a strong genetic background.[1] It has significant impacts on both physical and emotional health-related quality of life.[2] Endocrine disturbances plays an important role in pathogenesis and progression of psoriasis. Since, thyroid hormone receptors are expressed in human skin and the hormones exert their effects on epidermal proliferation and differentiation, they play a role in pathogenesis of psoriasis.[3] Cytokines secreted by Th1 and Th17 may increase serum lipid levels with increased hepatic de novo fatty acid synthesis and hepatic lipid secretion.[4,5] Dyslipidemia can also be attributed to the subject's life style, such as physical inactivity, inadequate nutrition and stress.[5]

Very less studies have been done in Nepal to see the association of thyroid dysfunction and dyslipidemia in psoriasis. Our study aims to determine the prevalence of thyroid dysfunction and dyslipidemia in psoriasis and find the association of thyroid dysfunction and dyslipidemia in psoriasis and compare it with controls.

METHODS

A prospective case-control study was conducted at the Department of Biochemistry, Nobel Medical College Teaching Hospital from November 2021 to October 2022 after obtaining ethical approval from institutional review committee. A total of 76 patients attending the dermatology department and clinically diagnosed as psoriasis were taken as case and 80 age and sex matched non-psoriatic patient coming for other skin lesions were included in the study as controls. Sample size was

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calculated taking the prevalence of psoriasis as 2%.[6] The inclusion criteria included patient above 18 years of age clinically diagnosed with chronic plaque psoriasis and disease duration of at least six months. Patients with history of antithyroid drug or thyroxine intake, lipid lowering drugs intake and other metabolic disorders were excluded from the study.

Informed consent was taken from all the patients and the patients details and laboratory investigations were recorded on the proforma.

Five milliliters of fasting blood sample was collected under aseptic conditions from the ante-cubital vein, centrifuged and analyses on the same day. 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. Thyroid profile consisting of free tri-iodothyronine (FT3), free thyroxine (FT4) and Thyroid-Stimulating Hormone (TSH) was estimated by chemiluminescence assay.

According to the serum TSH levels, participants were classified as having hypothyroidism (>6.6 MIU/L), euthyroid status (0.39-6.6 MIU/L) and hyperthyroidism (<0.39 MIU/L). Subclinical hypothyroidism was defined as high TSH and normal T3 and T4 levels and subclinical hyperthyroidism was defined for low TSH and normal T3 and T4 levels.[7]

According to National Cholesterol Education Programme's Adult Panel III (ATP III): hypertriglyceridaemia as TG > 150mg/ dl; high density lipoprotein (HDL) cholesterol < 40mg/dl, hypercholesterolemia > TC > 200mg/dl and Low density lipoprotein (LDL) > 150 mg/dl.[8]

The collected data were entered in Microsoft Excel and analyzed using SPSS version 16. Data were analyzed for descriptive statistics. Student unpaired t-test was calculated to determine significance of the results obtained. Odds ratio was calculated to see the association between exposure (psoriatic patients) and outcome (thyroid dysfunction and dyslipidemia).

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

This study was conducted among a total of 156 participants which included 76 patients diagnosed as chronic plaque psoriasis and 80 age matched controls. The mean age group among the psoriatic patients was 47.96 ± 10.63 years where as the mean age among the control group was 45.23 ± 12.78 years. Gender wise distribution of our study showed male predisposition among the psoriatic patients. The prevalence of thyroid dysfunction among the psoriatic patients was 26.31% in our population and the prevalent of dyslipidemia was 36.84% among the psoriatic patients. The prevalence of thyroid dysfunction and dyslipidemia was lower in the control groups (Table 1).

Table 1. Descriptive analysis of the study population.

Study population	Gender		Age (Years) Mean ±SD	Thyroid dysfunction (n=20) Prevalence	Dyslipidemia (n=28) Prevalence
	Male	Female			
Cases (n=76)	44	32	47.96 ±10.63	26.31%	36.84%
Controls (n= 80)	32	58	45.23 ±12.78	12.5%	6.25%

Serum free T3 levels and free T4 levels were lower in the psoriatic patients than those in the control groups which was statistically significant (p <0.01). Serum TSH was higher in the psoriatic groups than in the control but was not statistically significant. Our study clearly indicates that psoriasis is associated with thyroid dysfunction, more commonly hypothyroidism (Table 2).

Table 2. Association of Thyroid profile status between cases and control group.

	Psoriatic patients (n=76) (Mean ± SD)	Controls (n=80)	p value
Free T3 (pg/ml)	2.79 ± 1.03	3.16 ± 0.70	0.01
Free T4 (ng/dl)	1.14 ± 0.45	1.34 ± 0.47	0.01
TSH (MIU/ml)	4.2 ± 2.70	3.79 ± 1.77	0.26

Upon analyzing the thyroid profile of the patients with psoriasis, 73.68% (n=56) had normal thyroid function test. Hypothyroidism was more common among the thyroid abnormalities in our study population which was 13.15% (n=10), followed by subclinical hypothyroidism which was 10.52% (n=8). Hyperthyroidism was the least common thyroid abnormality associated with psoriatic patients (2.63%,n=2) (Table 3).

Table 3. Thyroid function test status in psoriatic patients.

Thyroid state	Number (n)	Percentage (%)
Euthyroid	56	73.68 %
Hyperthyroidism	2	2.63 %
Hypothyroidism	10	13.15 %
Subclinical hypothyroidism	8	10.52 %

Among the lipid parameters, mean total cholesterol level was 187.13 ± 52.15 mg/dl in the psoriatic patients where as it is 164.66 ± 19.98 mg/dl in the control groups.

The mean triglyceride level was 199.61 ± 64.96 mg/dl in psoriatic patients where as it is 142.33 ± 37.24 mg/dl. Our study also should increased low density lipoprotein in the psoriatic patients (98.16 ± 45.77 mg/dl) than in the control (83.00 ± 21.04 mg/dl) groups. High density lipoprotein was lower in the psoriatic patients than in the control groups (49.05 ± 5.52 mg/dl vs 53.26 ± 5.38 mg/dl) . The lipid parameters TC, TG and LDL were significantly higher in the psoriatic patients than in the control groups ($p<0.001$). HDL was significantly lower in the psoriatic groups when compared with the control group ($p<0.001$) as shown in table 4.

Table 4. Association of Lipid profile between case and controls.

Lipid parameters	Case	Control	P Value
Total Cholesterol (TC) (mg/dl)	187.13 ± 52.15	164.66 ± 19.98	<0.001
Triglyceride (TG) (mg/dl)	199.61 ± 64.96	142.33 ± 37.24	<0.001
High Density Lipoprotein (HDL) (mg/dl)	49.05 ± 5.52	53.26 ± 5.38	<0.001
Low Density Lipoprotein (LDL) (mg/dl)	98.16 ± 45.77	83.00 ± 21.04	0.01

We calculated odds ratio to see the association between psoriatic patients and thyroid dysfunction. In our study population, the odds of psoriatic patient having thyroid dysfunction was 2.8 times higher compared to other non-psoriatic patients as shown in table 5.

Similarly, when we calculated odds ratio to see the association between psoriatic patients and dyslipidemia, the odds of psoriatic patient having dyslipidemia was 8.7 times higher compared to other non-psoriatic patients as shown in table 6. Both the association were statistically significant ($p<0.01$ and $p<0.001$) (table 5 and 6).

Table 5. Association of Thyroid dysfunction with psoriasis (n=156).

	Cases (n=76)	Controls (n=80)	Odds ratio	95% confidence interval of Odds ratio	P value
Thyroid dysfunction (+)	20	9	2.8	1.19-6.66	0.01
Thyroid dysfunction (-)	56	71			

Table 6. Association of Dyslipidemia with psoriasis (n=156).

	Cases (n=76)	Controls (n=80)	Odds ratio	95% confidence interval of odds ratio	P value
Dyslipidemia (+)	28	5	8.7	3.16-24.22	< 0.0001
Dyslipidemia (-)	48	75			

DISCUSSION

Psoriasis, a chronic immune mediated inflammatory skin disorder causes a considerable psychosocial disability and has a major impact on patient's quality of life.[6] The association of endocrine system with psoriasis has been the interest of many researchers as the disease is an autoimmune disorder that flares up by psychoemotional stress.[9] We have also studied the thyroid hormone levels in psoriatic patients and tried it to compare it with the controls in our institution.

The mean age of our patients was 47.96 ± 10.63 years whereas it was 45.23 ± 12.78 years in the control groups. Similar age group was found in studies done by van et.al[3] and Nakhwa et.al.[10] Studies done by Salihbegovic et.al has shown similar mean age group of the psoriatic patients when compared with our study (47. 14 ± 15.41 vs 47.96 ± 10.63 years).[5]

Thyroid dysfunction was more prevalent in psoriatic patients than in the control groups (26.31% versus 12.5%). Studies have reported that thyroid hormones have role in pathogenesis of chronic psoriasis. T3 receptors on the skin has a role in keratin synthesis, cell growth, differentiation and proliferation of keratinocytes. T3 and T4 also have a hyper proliferative effect on skin via epidermal growth factor which is increased by thyroid hormones.[7]

Serum mean free T3 and T4 were lower in the psoriatic

patients than those in the control group which was statistically significant with p <0.01. Serum TSH was higher in the psoriatic patients than in the control groups as shown in table 2. The common thyroid abnormality in our study was hypothyroidism which was 13.15% (n=10). Subclinical hypothyroidism was seen in 10.52% (n=8) of our psoriatic patient, followed by hyperthyroidism which was seen in 2.63% (n=2). Subclinical hyperthyroidism was not present in our study patients. 73.68% (n=56) of our psoriatic patients were euthyroid. Thus, our study clearly states that hypothyroidism is the most common abnormality among the thyroid dysfunction in our study population. Our study findings was consistent with the similar mean free T3 and free T4 levels with the studies done by Van et.al,[3] Robati et.al[9] and Antonelli et.al.[11] Many studies has shown hypothyroidism as the most common thyroid dysfunction among the psoriatic patient which was similar to our study also. [7,12,13]

The risk of psoriatic patients in developing thyroid dysfunction was 2.8 times higher than in other non-psoriatic controls as shown by odds ratio calculation in table 5. Studies have shown that patients with thyroid dysfunction in psoriasis have higher CD3+ and CD4+ T cell absolute count, lower IgA and IgM levels and higher CRP levels, which shows association of psoriasis with inflammation. Thus, thyroid dysfunction in psoriatic patients is associated with inflammation caused by psoriasis.[14] Nevertheless, any association between thyroid dysfunction and psoriasis remains unclear and the exact role of thyroid hormones in etiopathogenesis of psoriasis needs elucidation by experimental studies for their anti-proliferative effect or that of antithyroid drugs on keratinocytes.[7]

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.[3] Thus, we have tried to assess lipid parameters in patients of clinically diagnosed psoriasis in our study.

The prevalence of dyslipidemia was higher in the psoriatic patients (36.84%) than in the controls (6.25%) as found in our study. Our findings was consistent with the findings of many other studies done in Nepal by Kafle et.al,[4] India by Bajaj et.al[15] and Pakistan by Ghafoor et.al.[16]

In our study, the mean total cholesterol level was higher (187.13 ± 52.15 mg/dl) in the psoriatic patients where as it is 164.66 ± 19.98 mg/dl in the control groups which was statistically highly significant with p<0.001. Our finding was similar to the findings of study done by Nakhwa et.al[10] Studies have shown that hypercholesterolemia as a risk factor for incident psoriasis in a large cohort. Hypercholesterolemia is able to induce microvascular inflammation with the involvement of immune system where T lymphocytes may be one of the early cell types activated by hypercholesterolemia. Interestingly, psoriasis is characterized by T-cell-mediated hyperproliferation of keratinocytes and inflammatory processes and is classified as a T helper 1 (Th1) disease.[17]

The mean triglyceride levels in our study was also significantly higher in the psoriatic patients than that in the control groups (p<0.001). Serum HDL cholesterol which is considered as cardiprotective is significantly lower in the psoriatic patients than in the control groups (p<0.001). Though the association between psoriasis and dyslipidemia has been confirmed by many studies, the precise mechanism of that connection is yet to be known. It is considered that proinflammatory cytokines in those affected by psoriasis can also affect the metabolism of lipids, but diet and medicines used for treatment of psoriasis are also important.[5]

Serum LDL levels were significantly higher in the psoriatic patients than in the controls which was statistically significant (p<0.01). Many studies has shown that psoriatic patients have a pro-atherogenic lipid profile with raised total cholesterol, LDL and a decreased cardioprotective HDL.(4) Our findings was consistent with the findings of the studies done in Nepal by Kafle et.al (4) and Poudyal et.al.[18]

The odds of psoriatic patients having dyslipidemia was 8.7 times higher compared to other non-psoriatic patients in our study as shown in table 6. In a systematic review, 20 of 25 included studies found significant associations between psoriasis and dyslipidemia with ORs ranging from 1.04 to 5.55.[19] These lipid abnormalities seen in psoriasis might facilitate and maintain the inflammatory reaction in the skin. The level of antibodies against oxidized LDL may be reported to related with disease severity.[16]

CONCLUSIONS

Our study showed a significant co-relation between psoriasis and thyroid dysfunction, thus we recommend that it requires attention of clinicians for thyroid evaluation and early detection of thyroid disorders in these patients to avoid further worsening of both disease. In consensus with other studies done in different part of

the world, our study also concluded increased prevalence of dyslipidemia in psoriatic patients.We can strongly recommend to follow lipid status in psoriatic patients considering it as its risk factor for atherosclerosis and other cardiovascular accidents.. It is recommended that psoriasis patient should be screened routinely for thyroid function and lipid disorders for a holistic management. Hence, increased awareness of psoriasis comorbidities are critical to improving the care and quality of life for those living with psoriasis.

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CONFLICT OF INTEREST

The authors declare no conflict of interest

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