

# Cutaneous manifestations of hypothyroidism: An observational study in a tertiary care center of Eastern India



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## ABSTRACT

**Background:** Changes in skin, hair, and nails may be initial manifestations of an underlying thyroid hormone deficiency. Symptomatic treatment of cutaneous manifestations without treatment of underlying hypothyroidism contributes to long-term morbidity in patients. **Aims and Objectives:** The aim of the study was to study the cutaneous manifestations and demographic profile of patients with hypothyroidism. **Materials and Methods:** We conducted a hospital-based cross-sectional study of 200 patients presenting with cutaneous changes in primary hypothyroidism for a period of 18 months. A detailed history, clinical examination, and relevant investigations were performed. **Results:** Out of 200 patients, cutaneous manifestations were more prevalent in the age group between 30 and 49 years. The ratio of male to female was 1.0:6.4. A family history of hypothyroidism was present in 34.5% of patients. The most common cutaneous features were alteration in skin texture (53.0%), dry skin (48.5%), generalized pruritus (42.5%), urticaria (17%), followed by pigmentation of the skin (34.5%), out of which vitiligo was 9.0%, melasma was 5.5%, and others were 20.0%. Other changes include xerosis (32.5%), eczematous disorder (13%), acquired palmoplantar keratoderma (11.5%), and brittle nails (3.5%). 39.5% had hair changes, out of which diffuse hair loss was 17.5%, coarse hair was 12%, alopecia areata was 4.5%, and lateral loss of eyebrows was 4.5%. Changes in the oral cavity and mucous membrane were present in 3.0% of the patients, which included lip vitiligo (1.5%), oral lichen planus (1%), and oral candidiasis (0.5%). Menstrual abnormalities were present in 50.84% of females. The percentage of hypothyroid patients who complained of easy fatigability, facial puffiness, cold intolerance, weight gain, constipation, neck swelling, hoarseness of voice, increased sleeping pattern, and non-pitting edema of feet were 38.5%, 36.5%, 26.0%, 23.5%, 17.0%, 9%, 8%, 7.5%, and 6.5%, respectively. **Conclusion:** Based on our study, it can be concluded that the presence of certain skin conditions, such as alteration in skin texture, dry skin, generalized pruritus, urticaria, skin pigmentation, and diffuse hair loss, may indicate the possibility of hypothyroidism. These cutaneous manifestations may occur earlier than the diagnosis of hypothyroidism through biochemical testing. Therefore, it is important to consider the possibility of hypothyroidism when examining patients with these skin conditions.

**Key words:** Hypothyroidism; Cutaneous findings; Thyroid disorders

## INTRODUCTION

Endocrine hormones, when in excess or deficient, result in changes in cutaneous morphology and function.<sup>1</sup> Like most systemic pathologies, hypothyroidism may be

expressed through the skin and its adnexa.<sup>2</sup> Diagnosis of the underlying endocrinopathy is essential both for the treating physician and the patient. Early diagnosis and treatment can prevent morbidity associated with endocrine as well as skin diseases.

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Thyroid hormones play an important role in maintaining the normal activity of the integuments in the human body. Thyroid hormonal dysfunction, whether in a hyperactive or hypoactive state, can lead to various abnormalities of the skin, hair, and nails.

The diagnosis of primary hypothyroidism is made by measurement of above-normal levels of serum thyroid-stimulating hormone (TSH) and low free T4 levels. In cases of subclinical hypothyroidism, free T4 may be normal in the early stages.<sup>3</sup>

Cutaneous changes associated with thyroid disease are neither unique nor pathognomonic. However, such findings often provide important clues in instances of unsuspected and undetected thyroid disease.

The present study aims to highlight the various cutaneous as well as systemic manifestations associated with primary hypothyroidism. Very limited studies have been published so far elaborating on the cutaneous and systemic findings associated with primary hypothyroidism.

### Aims and objectives

The study aims to find out the various cutaneous and systemic manifestations associated with hypothyroidism and to determine their relative frequencies. It also aims to describe the demographic profile of such patients.

## MATERIALS AND METHODS

We conducted an observational study at our tertiary care center by enrolling 200 patients who visited the department of dermatology and endocrinology. All patients had cutaneous symptoms and were suffering from primary hypothyroidism. We obtained informed consent from all participants, and the study was approved by the institute's ethical review committee.

A detailed history, thorough clinical examination, and relevant investigations were performed to determine the relative frequency of cutaneous diseases among patients with hypothyroidism. Demographic data, including age, sex, and family history of hypothyroidism, were also assessed. Microsoft Excel was used for data analysis, and SPSS software was used for statistical analysis.

### Inclusion criteria

Our study included all patients who had cutaneous findings in a case of primary hypothyroidism and visited the dermatology outpatient and inpatient departments, as well as the endocrinology outpatient department.

### Exclusion criteria

Patients with coexistent renal failure, diabetes mellitus, AIDS, Hansen's disease, or those on hypolipidemic drugs were excluded from the study.

## RESULTS

We studied 200 patients with a mean age of  $35.75 \pm 14.04$  years, a range of 4–70 years, and a median age of 35.5 years. Most of the patients (50.5%) with cutaneous findings were in the age group between 30 and 49 years. The male: female ratio was 1.0:6.4. A family history of hypothyroidism was found in 34.5% of patients.

Among the general clinical features, abnormal menstrual history (50.84%) was most common among females of the reproductive age group. Out of 173 females in our study group, 55 had a history of hysterectomy or menopause; hence, they were excluded from the calculation. This was followed by easy fatigability (38.5%), facial puffiness (36.5%), cold intolerance (26%), weight gain (23.5%), constipation (17%), pallor (13.5%), neck swelling (9%), hoarseness of voice (8%), increased sleep duration (7.5%), and non-pitting edema of the lower limbs (6.5%) (Table 1).

In our study group, the most common cutaneous feature was alteration in skin texture (53.0%) (Figure 1), followed by dryness of skin (48.5%), generalized pruritus (42.5%), xerosis (32.5%), associated pigmentation (20.5%), urticaria (17.0%) (Figure 2), eczematous disorders (13%), palmoplantar keratoderma (11.5%), and oral cavity and mucous membrane changes (3.0%) (Table 2).

Hair changes were found in 39.5% of patients, out of which diffuse hair loss (17.5%) (Figure 3) was most common, with others being coarse hair (12%), lateral loss of eyebrows (4.5%), and alopecia areata (5.5%) (Figure 4).

Brittle nails were found in 3.5% of patients. Palmoplantar keratoderma without any other cause was present in 4%

**Table 1: General symptoms in hypothyroid patients**

S. No.	General symptoms	No. of patients	Percentage
1	Abnormal menstrual history	60	50.84
2	Easy fatigability	77	38.5
3	Facial puffiness	73	36.5
4	Cold intolerance	52	26
5	Weight gain	47	23.5
6	Constipation	34	17
7	Pallor	27	13.5
8	Neck swelling	18	9
9	Hoarseness of voice	8	8
10	Increased duration of sleep	15	7.5
11	Non-pitting edema of lower limbs	13	6.5



**Figure 1:** Alteration of skin texture in a 36-year-old female diagnosed with primary hypothyroidism on routine investigations



**Figure 4:** Alopecia areata in a newly diagnosed case of primary hypothyroidism



**Figure 2:** Chronic idiopathic urticaria in a case of hypothyroidism



**Figure 3:** Diffuse hair loss in 45-year-old female with primary hypothyroidism

of cases, and the underlying causes were hyperkeratotic eczema (4.5%) and palmoplantar psoriasis (3%).

**Table 2: Cutaneous symptoms and signs in hypothyroid patients**

S. No.	Cutaneous symptoms and signs	Number of patients	Percentage
1	Alteration in skin texture	106	53.0
2	Dryness of skin	97	48.5
3	Generalized pruritus	85	42.5
4	Hair changes	79	39.5
5	Xerosis	65	32.5
6	Associated pigmentation	41	20.5
7	Urticaria	34	17.0
8	Palmoplantar keratoderma	23	11.5
9	Brittle nails	7	3.5
10	Oral cavity and mucous membrane changes	6	3.0

Amongst the oral cavity and mucous membrane changes, three patients had lip vitiligo (1.5%), two patients had oral lichen planus (1%), and one patient had candidiasis (0.5%). Changes in the oral cavity and mucous membrane coexisted with other cutaneous manifestations.

Associated skin pigmentation was present in 20.5% of patients, out of which vitiligo was found in 9.0% of cases (Figure 5) and melasma in 5.5% of cases. Other pigmentary disorders observed in our study were acanthosis nigricans (AN) (2.5%), macular amyloidosis (1%), pityriasis versicolor (1%), lichen planus pigmentosus (0.5%), lichen amyloidosis (0.5%), and periorbital hyperpigmentation (0.5%).

The prevalence of other associated disorders in our study group was lichen simplex chronicus (4%), prurigo simplex (3.5%), chronic plaque psoriasis (3%), acne vulgaris (3%), polymorphous light eruption (3%), eruptive lichen planus (1.5%), candidiasis (1%), intertrigo (1%), discoid lupus erythematosus (0.5%), seborrheic keratosis (0.5%),



**Figure 5:** Vitiligo in a case of primary hypothyroidism

ecchymosis (0.5%), keratosis pilaris (0.5%), pityriasis lichenoides chronica (0.5%), and tinea corporis (0.5%) (Table 3).

Eczematous disorders associated with hypothyroidism found in our study were seborrheic dermatitis (5%), hyperkeratotic eczema (3%), miliarial dermatitis (1.5%), lichenoid dermatitis (1%), dyshidrosiform eczema (1%), nummular dermatitis (0.5%), photodermatitis (0.5%), and stasis dermatitis (0.5%) (Table 4).

The patients had a mean free T4 level of  $0.82 \pm 0.77$  ng/dL with a range of 0.12–5.97 ng/dL and a median of 0.69 ng/dL. Most of the patients had free T4 levels below the normal limit (57.0%). Only 3.0% of the patients had a free T4 level above the normal limit. The mean TSH level was  $13.24 \pm 17.24$  microIU/mL, with a range of 4.06–150.00 microIU/mL and the median being 8.90 microIU/mL. All the patients had TSH levels above the normal limit (100.00%).

## DISCUSSION

In our study group of 200 patients, 50.5% presenting with cutaneous changes were in the age group of 30–49 years. The observation of similarities between age groups in various studies may be due to the normal prevalence of thyroid disease.<sup>4,6</sup>

The ratio of males to females in our study was 1.0:6.4. This observation of female preponderance may be due to an increased association of autoimmune disorders in females, with autoimmunity being an important cause of hypothyroidism.<sup>4,5,7</sup>

A history of first-degree relatives with hypothyroidism was present in 34.5% of patients. Family history of hypothyroidism has not been included in any other studies

**Table 3: Dermatological diseases associated with hypothyroidism**

Name of disease	Percentage
Chronic plaque psoriasis	3
Acne vulgaris	3
Lichen simplex chronicus	4
Prurigo simplex	3.5
Polymorphous light eruption	3
Eruptive lichen planus	1.5
Candidiasis	1
Intertrigo	1
Discoid lupus erythematosus	0.5
Seborrheic keratosis	0.5
Ecchymosis	0.5
Keratosis pilaris	0.5
Pityriasis lichenoides chronica	0.5
Tinea corporis	0.5

**Table 4: Eczematous disorders associated with hypothyroidism**

Name of disease	Percentage
Seborrheic dermatitis	5
Hyperkeratotic eczema	3
Miliarial dermatitis	1.5
Lichenoid dermatitis	1
Dyshidrosiform eczema	1
Nummular dermatitis	0.5
Photodermatitis	0.5
Stasis dermatitis	0.5

known to us. Therefore, its prevalence could not be compared in different study populations. A positive family history of hypothyroidism may have higher chances of developing cutaneous manifestations.

### General features

Menstrual irregularity was the most common systemic manifestation in our study among females in the reproductive age group. It was present in 50.84% of patients, manifesting as excessive and irregular menstrual bleeding. Due to a deficiency of thyroid hormone, the secretion of progesterone is inadequate, and there is persistence of endometrial proliferation, which may lead to excessive and irregular breakthrough menstrual bleeding.<sup>8</sup>

Easy fatigability was present in 77 patients (38.5%). Thyroid hormone is essential for the proper functioning of the central nervous system. Studies have shown TSH receptor-Glu 727 increases the ability of neurons to adjust intracellular thyroid hormone levels, thereby affecting neuropsychological functioning.<sup>9</sup>

Cold intolerance was found in 26.0% of cases. As there is a hemodynamic alteration in the body due to a deficiency of thyroid hormones, there is a reduction of cutaneous circulation, which may result in cold sensitivity.<sup>4,5</sup> Hypothermia is due to a hypometabolic state, which causes reduced core temperature and reflex cutaneous vasoconstriction.<sup>1</sup>

Weight gain was present in 23.5 % of cases in our study. Thyroid hormones regulate basal metabolism and thermogenesis and play an important role in lipid and glucose metabolism, food intake, and fat oxidation. Hypothyroidism is associated with decreased thermogenesis and a decreased metabolic rate and has also been shown to correlate with a higher body mass index and a higher prevalence of obesity.<sup>10,11</sup>

Constipation was present in 17.0% of patients. Hypothyroidism may cause changes in the motor activity of the digestive system, resulting in frequent complaints of constipation.<sup>4,12</sup>

### Cutaneous features

Alterations in skin texture and dry skin conditions were present in 48.5% and 53% of patients, respectively. These findings were similar to those of studies conducted by Kumar and Aslami<sup>5</sup> and Jamwal et al.<sup>6</sup> Thyroid hormone has a direct effect on the skin tissues through the thyroid hormone receptor. Therefore, thyroid hormone plays an important role in epidermal homeostasis. Deficiency may lead to altered skin texture, such as rough, coarse, scaly skin, especially over the extremities, as well as dry skin.<sup>13</sup>

Generalized pruritus without any known cause was present in 42.5% of the patients in our study. This may be due to extreme dry and coarse skin conditions because of thyroid hormone deficiency, as already explained.

Facial puffiness was present in 41.07% of patients. Facial puffiness and non-pitting edema of the hands and feet are related to tissue infiltration with muco-polysaccharides predominantly in the papillary dermis around the vessels and appendages, as well as an increase in sodium concentration with associated water retention.<sup>1</sup>

Xerosis was present in 32.5% of patients. Few patients in our study group had severe xerosis manifesting as xerotic dermatitis (4.5%). The xerosis, in some cases, was severe enough to be considered an acquired ichthyosis. Xerosis in hypothyroidism may be due to decreased activity of the sweat glands and sebaceous glands and low epidermal sterol synthesis.<sup>14</sup>

Chronic urticaria with no known cause was present in 34 patients (17%). Chronic idiopathic urticaria has been thought to be associated with autoimmune conditions, particularly autoimmune hypothyroidism.<sup>15,16</sup>

Hair changes were present in 39.5% of cases. The various hair changes in our study group were diffuse hair loss (17.5%), coarse hair (12%), and lateral loss of eyebrows (3%). These hair changes associated with hypothyroidism

may be mediated by hormone effects on the initiation as well as the duration of hair growth.<sup>13</sup>

In our study group, 5.5% of patients with hypothyroidism had associated alopecia areata. Autoimmune hypothyroidism has a frequent association with other autoimmune conditions, like alopecia areata. All these hair changes in hypothyroidism have been established in various studies.<sup>5,6,13,17,18</sup>

Brittle nails were present in 3.5% of cases. One patient (0.5%) presented with onychomycosis. Hypothyroidism causes hypothermia from a decreased metabolic rate, and there is secondary compensatory vasoconstriction. Vasoconstriction decreases the flow of nutrients and oxygen to the cutaneous structures as a result and may cause slow-growing, brittle nails.<sup>19</sup> Onychomycosis may be an incidental finding and may not be related to hypothyroidism.

Acquired palmoplantar keratoderma was present in 23 patients (11.5%). Out of which, palmoplantar keratoderma, without any other cause, was present in 8 patients (4%). Palmoplantar keratoderma with underlying causes includes hyperkeratotic eczema in 9 patients (4.5%) and palmoplantar psoriasis in 6 patients (3%). Extremely severe dryness of the palms and soles in hypothyroidism may give rise to acquired palmoplantar keratoderma.<sup>1</sup> Similarly, hyperkeratotic eczema leading to palmoplantar keratoderma in patients with hypothyroidism may be due to the itching associated with extreme dryness in hypothyroidism. Psoriasis is an autoimmune condition that may be associated with autoimmune hypothyroidism.<sup>13</sup>

Oral cavity and mucous membrane changes were present in 6 patients (3.0%). Changes included lip vitiligo (1.5%), erosive lichen planus (1%), and oral candidiasis (0.5%). These changes coexisted with various other cutaneous manifestations among patients in our study.

Associated skin pigmentation was present in 20.5% of patients, out of which 9% had vitiligo. Studies conducted by Sedighe and Gholamhossein<sup>20</sup> and Gopal et al.,<sup>21</sup> have found an association between autoimmune hypothyroidism and vitiligo.

Melasma was present in 5.5% of patients. The association between hypothyroidism and melasma has been well documented by Lutfi et al., in their study.<sup>22</sup> Melasma may have an autoimmune etiology. Hormones like estrogen and/or progesterone may be the triggering factors for development of melasma in person predisposed to autoimmune hypothyroidism.<sup>8,22</sup>

In our study, AN was observed in 2.5% of patients. A study conducted by Puri<sup>23</sup> has demonstrated a slightly higher prevalence of AN in hypothyroidism. Syndromic AN, specifically type B syndrome, has an association with Hashimoto thyroiditis. Circulating antibodies to insulin receptors may be present.<sup>23</sup>

Other pigmentary disorders in our study were macular amyloidosis (1%), pityriasis versicolor (1%), lichen planus pigmentosus (0.5%), lichen amyloidosis (0.5%), and periorbital hyperpigmentation (0.5%).

Lichen simplex chronicus was seen in 8 patients (4%). Prurigo simplex was seen in 7 patients (3.5%). A polymorphous light eruption was seen in 6 patients (3%).

Chronic plaque psoriasis and acne vulgaris were seen in 3% of cases. Eruptive lichen planus was present in 1.5% of patients. Candidiasis and intertrigo were present in 1% of cases each, respectively. Discoid lupus erythematosus, seborrheic keratosis, ecchymosis, keratosis pilaris, pityriasis, lichenoides chronica, and tinea corporis were present in 0.5% of cases each, respectively.

Associated dermatitis in patients with hypothyroidism in our study included seborrheic dermatitis (5%), hyperkeratotic eczema (3%), miliarial dermatitis (1.5%), lichenoid dermatitis (1%), dyshidrosiform eczema (1%), nummular dermatitis (0.5%), photodermatitis (0.5%), and stasis dermatitis (0.5%).

All these disorders were presented in our study either as a single entity or along with the cutaneous manifestations mentioned in the discussion above.

### Limitations of the study

As the study was a cross-sectional observational study, a significant correlation between hypothyroid cases and cutaneous findings could not be established. Furthermore, our study was a single-centre study and the study period was also limited.

## CONCLUSION

From our study, we can conclude that various cutaneous manifestations can be associated with hypothyroidism or can even manifest earlier than the biochemical diagnosis of hypothyroidism. Additional co-morbidities may also be present in the form of autoimmune dermatoses such as chronic autoimmune urticaria, vitiligo, chronic plaques psoriasis, and lichen planus. Hence, the presence of cutaneous findings like alteration in skin texture, xerosis, generalized pruritus, pigmentary changes and diffuse hair

loss emphasizes the investigation directed towards the diagnosis of hypothyroidism.

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**Author's Contribution:**

**SD-** Definition of intellectual content, literature survey, prepared first draft of manuscript, implementation of study protocol, data collection, data analysis, manuscript preparation, and submission of article; **AG-** Review manuscript, editing, coordination, and manuscript revision.

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