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# Clinico-epidemiological study of PMLE and biochemical correlation of thyroid dysfunction

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## ABSTRACT

### Introduction

Polymorphic light eruption (PMLE) is a prevalent photodermatosis characterized by pruritic papules or plaques that develop after exposure to sunlight. It predominantly affects young females, especially during spring and summer. The precise etiology remains unclear, but immune dysregulation, particularly related to UV-induced damage, is believed to play a key role. Thyroid dysfunction, particularly hypothyroidism, has been associated with immune alterations that may impact skin sensitivity and exacerbate PMLE. This study aims to explore the clinico-epidemiological profile of PMLE and its biochemical correlation with thyroid dysfunction.

### Materials and Methods

This hospital-based cross-sectional study included 100 patients diagnosed with PMLE, aged 10 years and above, over a one-year period. Demographic data and clinical findings were collected, and thyroid function tests (TSH, T3, T4, and anti-TPO antibodies) were performed. Data were analyzed using SPSS software.

### Results

The study revealed that PMLE most commonly affected females (60%) in the 21-30 years age group (35%). Papular lesions (50%) were the most prevalent, and pruritus was present in 80% of cases. Thyroid abnormalities were observed in 25% of patients, with subclinical hypothyroidism being the most common. A significant correlation was found between PMLE severity and thyroid dysfunction, with 50% of patients with severe PMLE showing thyroid abnormalities.

### Conclusion

The study suggests a potential link between thyroid dysfunction, particularly subclinical hypothyroidism, and the severity of PMLE. Routine thyroid screening in PMLE patients may be beneficial, especially for those with recurrent or severe cases.

**Keywords:** *Polymorphic light eruption, thyroid dysfunction, autoimmune diseases, photosensitivity, hypothyroidism, clinical correlation.*

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## INTRODUCTION

Polymorphic light eruption (PMLE) is the most prevalent form of photodermatoses, and it is characterized by the eruption of erythematous, pruritic papules or plaques after exposure to solar radiation. The condition most commonly affects young women and is frequently triggered in the spring and summer seasons, which are sun-exposure seasons. The etiology of PMLE is not well understood, but it is believed to be caused by immune dysregulation, more specifically in response to damage caused by ultraviolet (UV) light. The role of the thyroid gland and its association with dermatological disorders such as PMLE has become a focus of interest. Thyroid dysfunction, particularly hypothyroidism, has been implicated in alterations in the immune system, which could play a potential role in the occurrence and severity of skin disorders such as PMLE[1,2].

PMLE affects predominantly young adults, with higher prevalence in females (70-90%) compared to males. The condition is most commonly seen in Caucasians, particularly individuals who belong to Fitzpatrick skin types I and II. PMLE is reported to affect 10-20% of the general population, with some geographic locations having high prevalence, especially in temperate climates where UV exposure is more significant in the summer months[3]. Even though PMLE can occur at any time of the year, it is more frequently seen to occur in the spring and early summer, which are sun-exposure seasons. This seasonal presentation is most likely due to sensitization of the body to UV radiation after prolonged sun exposure.

Several studies have investigated the association of autoimmune and thyroid diseases with dermatological disorders. In polymorphic light eruption (PMLE), thyroid dysfunction, especially hypothyroidism, has been reported to increase the immune response and affect the sensitivity of the skin to ultraviolet (UV) radiation[4]. A research study by Nermin et al. (2019) established that a high percentage of PMLE patients had abnormal thyroid function, i.e., subclinical hypothyroidism. While some studies have reported an association between thyroid dysfunction and PMLE, the results are inconclusive because of heterogeneity in sample size, diagnostic criteria, and environmental factors[5]. Therefore, there is a need to investigate the biochemical interaction between PMLE and thyroid dysfunction, particularly in Indian populations.

The rising incidence of PMLE and its significant impact on the quality of life in affected patients emphasize the need for a better understanding of its intrinsic pathophysiology. Moreover, thyroid disorders are common in the general population, and their potential association with PMLE may offer new evidence to treat and prevent this photodermatosis. Given the fact that thyroid dysfunctions like hypothyroidism and autoimmune thyroiditis have an association with a change in immune function, there is a need to explore the role they may play in modulating the clinical presentation and severity of PMLE[6]. This research study tries to fill the knowledge gap by investigating the clinico-epidemiological profile of PMLE patients and assessing their biochemical thyroid profiles. Understanding this association may improve the treatment options and preventive measures in individuals predisposed to develop PMLE.

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## AIM AND OBJECTIVES

### Aim:

To study the clinico-epidemiological profile of polymorphic light eruption (PMLE) and its biochemical correlation with thyroid dysfunction in affected individuals.

### Objectives:

1. To evaluate the demographic, clinical, and epidemiological characteristics of patients diagnosed with PMLE.
2. To assess the biochemical parameters of thyroid function (TSH, T3, T4, anti-TPO antibodies) in patients with PMLE.

## MATERIALS AND METHODS

### Study Design and Setting

This is a hospital-based cross-sectional study conducted in the Department of Dermatology at a tertiary care center over a period of one year. Patients diagnosed with polymorphic light eruption (PMLE) were recruited for the study.

### Study Population and Sample Size

A total of 100 patients with clinically diagnosed PMLE were included in the study. Patients were selected based on predefined inclusion and exclusion criteria.

### Inclusion Criteria

1. Patients aged 10 years and above with clinical features suggestive of PMLE.
2. Willingness to participate in the study and provide informed consent.
3. No prior treatment with systemic immunosuppressants or phototherapy in the last three months.

### Exclusion Criteria

1. Patients with other photodermatoses, connective tissue disorders, or chronic skin conditions mimicking PMLE.
2. Pregnant or lactating women.
3. Individuals with known thyroid disorders undergoing treatment.

### Data Collection

A structured proforma was used to collect demographic details, clinical history, and examination findings of the participants. Dermatological assessment included lesion morphology, distribution, and associated symptoms. Family history and history of sun exposure were also recorded.

### Laboratory Investigations

All participants underwent thyroid function tests, including:

- Serum Thyroid-Stimulating Hormone (TSH)
- Free Triiodothyronine (T3)
- Free Thyroxine (T4)
- Anti-Thyroid Peroxidase (Anti-TPO) antibodies

ISSN: 0975-3583, 0976-2833 VOL16, ISSUE 2, 2025

Blood samples were collected under aseptic conditions and analyzed using standard laboratory methods.

**Statistical Analysis**

Data were analyzed using SPSS software. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages.

## RESULTS

**Table 1: Demographic and Clinical Characteristics of PMLE Patients**

| Parameter | Frequency (n=100) | Percentage (%) |
|---|---|---|
| **Age Group (Years)** | | |
| 10-20 | 15 | 15% |
| 21-30 | 35 | 35% |
| 31-40 | 30 | 30% |
| >40 | 20 | 20% |
| **Gender** | | |
| Male | 40 | 40% |
| Female | 60 | 60% |
| **Fitzpatrick Skin Type** | | |
| Type I-II | 25 | 25% |
| Type III-IV | 55 | 55% |
| Type V-VI | 20 | 20% |

**Table 2: Clinical Presentation of PMLE**

| Clinical Feature | Frequency (n=100) | Percentage (%) |
|---|---|---|
| **Lesion Type** | | |
| Papular | 50 | 50% |
| Plaque | 20 | 20% |
| Vesicular | 15 | 15% |
| Erythematous | 15 | 15% |
| **Pruritus Present** | 80 | 80% |
| **Family History of PMLE** | 30 | 30% |

**Table 3: Thyroid Function Test Abnormalities in PMLE Patients**

| Thyroid Function Parameter | Normal (n) | Abnormal (n) | Percentage Abnormal (%) |
|---|---|---|---|
| TSH | 75 | 25 | 25% |
| Free T3 | 90 | 10 | 10% |
| Free T4 | 85 | 15 | 15% |
| Anti-TPO Antibodies | 80 | 20 | 20% |

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**Table 4: Correlation Between Thyroid Dysfunction and PMLE Severity**

| PMLE Severity | Euthyroid (n) | Subclinical Hypothyroidism (n) | Overt Hypothyroidism (n) | Hyperthyroidism (n) |
|---|---|---|---|---|
| Mild | 40 | 10 | 2 | 1 |
| Moderate | 30 | 8 | 6 | 2 |
| Severe | 10 | 5 | 5 | 1 |

## DISCUSSION

Polymorphic light eruption (PMLE) is a common form of photosensitive dermatosis that predominantly occurs in young women, typically in the form of pruritic lesions on sun-exposed skin. In our current study, clinico-epidemiological characteristics and biochemical correlation of thyroid dysfunction in PMLE patients were investigated. Our findings from the study are compared with the literature.

Most of the patients in our study were female (60%) and the age group 21-30 years was most commonly affected (35%). Our study is in agreement with studies by Chirag et al.[7] (2018), which showed that PMLE occurs predominantly in young adult women. The age group 21-30 years has been commonly reported as the peak age of onset of PMLE, possibly due to more outdoor activities and exposure to sunlight at this age. Our study also showed that the most common Fitzpatrick skin type in PMLE patients was Type III-IV (55%), in agreement with Chrristina et al.[8] (2019), which reported that skin types I-IV are more prone to PMLE as they contain less melanin and are therefore more prone to ultraviolet damage.

Clinical presentation in the current study found papular lesions to be the most frequent (50%), erythematous (15%), vesicular (15%), and plaque lesions (20%). This is in agreement with the observation made by Prudence et al.[9] (2022), whose research found papular lesions to be the most frequent clinical feature of PMLE. Prevalence of pruritus (80%) in the current population was also consistent with Seale et al.[10] (2022), who observed that pruritus is a classical PMLE symptom and usually manifests with the inflammatory reaction of the skin upon sun exposure.

Thyroid dysfunction as a risk factor for PMLE has been postulated. In our research, 25% of the patients were found to present with thyroid-stimulating hormone (TSH) abnormalities, most of them being subclinical hypothyroidism. Likewise, Ahmad et al. (2011) found an association of autoimmune thyroid disease with PMLE, where thyroid autoimmunity is a prevailing factor in PMLE pathogenesis. Immune response and skin homeostasis being controlled by thyroid hormones can be behind this association. Stern et al. (2007) also observed that thyroid autoimmunity, as indicated by a high titer of anti-TPO antibodies, was more frequent among PMLE patients than among the general population. In our research, 20% of the patients had abnormal anti-TPO antibodies, a finding in favor of dysregulation of the immune response in PMLE, which could be involved by thyroid autoimmunity.

Furthermore, 15% of our patients had abnormalities in free T4, and 10% had abnormalities in free T3, which conforms to observations by Mishra et al.[11] (2022), who documented alterations in thyroid hormone levels in PMLE patients. Thyroid hormones have

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been believed to modulate ultraviolet radiation sensitivity of the skin, either through alteration of immune function or through the repair process of the skin, and further enhance photosensitivity in PMLE patients. Incidence of thyroid dysfunction in PMLE patients must prompt clinicians to screen for thyroid function, with the possibility of a bidirectional interaction between autoimmune skin diseases and thyroid dysfunction being considered.

We found a close association between severity of PMLE and thyroid dysfunction in our study. In PMLE patients with severe PMLE, 50% had abnormal thyroid function in the form of subclinical hypothyroidism. This concurs with Sharma et al.[12] (2014), who documented severity of photosensitive eruptions as a correlate with thyroid dysfunction. Thyroid hormones regulate immune function and inflammatory pathways, and dysregulation here could exacerbate the clinical severity of PMLE. The evidence from this study suggests that thyroid dysfunction could be a causative factor in PMLE with severity, but additional studies are needed to determine the underlying mechanisms.

Our findings are parallel to a great degree to Ganapathy et al.[13] (2018), who described the correlation of thyroid dysfunction with autoimmune diseases, such as PMLE. They described that autoimmune thyroid disease, i.e., Hashimoto's thyroiditis, was more common in patients with PMLE. They hypothesized that immune mechanisms in PMLE and thyroid dysfunction can overlap, theoretically due to similar genetic predispositions. Mishra et al.[14] (2022) and Chirag et al.[15] (2018) carried out studies that could not establish any correlation between thyroid dysfunction and severity of PMLE, and hence the correlation can be intricate and may be affected by other variables, such as environmental factors or genetic predispositions that predispose an individual to both diseases.

## CONCLUSION

The study reveals that polymorphic light eruption (PMLE) is more common in females, with a higher prevalence in the 21-30 age group. The most common lesion type is papular, with pruritus being a predominant symptom. A significant proportion of patients exhibit thyroid function abnormalities, particularly subclinical and overt hypothyroidism. The severity of PMLE is associated with thyroid dysfunction, suggesting a possible link between immune dysregulation and photosensitivity. The study emphasizes the need for routine thyroid function screening in patients with PMLE, especially those with recurrent or severe presentations, for better disease control and patient outcomes.

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