

## Polymorphous Light Eruption- An Indian Scenario

### Abstract

Polymorphous light eruption (PMLE) is the most common, idiopathic, acquired photodermatosis, characterized by abnormal, recurrent, and delayed reaction to sunlight. Polymorphous light eruption is common worldwide but the morphology, distribution, and pigmentary changes are unique in Indian skin which is discussed in this review. The prevalence of PMLE is around 10–20% in the general population. It commonly occurs in females between 20 and 30 years of age. It is the most common photodermatosis in school-going children. Visible light sensitivity is an important phenomenon in PMLE. It typically presents as recurrent and chronic lesions over photoexposed sites. Initially, patchy erythema occurs with pruritus. Most of the Indians belong to type IV to type VI skin and pigmentary changes are commonly seen. The unique feature of PMLE in Indian skin is the pigmentary change which varies from hypopigmented to hyperpigmented lesions. These pigmentary changes may occur alone or in combination with erythematous or skin-colored lesions. The pigmentary lesions are seen in more than 50% of lesions. The histopathology of PMLE is characterized by the presence of hyperkeratosis, spongiosis with or without the presence of liquefactive degeneration in the epidermis. Dermal changes in the upper and mid dermis include the presence of dense perivascular lymphocytic infiltrate. The management of PMLE includes both preventive measures and medical management. Topical sunscreens, topical steroids, hydroxychloroquine and antioxidants play a very important role.

**Keywords:** Hydroxychloroquine, Indian, pigmentary changes, polymorphous light eruption

### Polymorphous light eruption- an Indian Scenario

Polymorphous light eruption (PMLE) is the most common, idiopathic, acquired photodermatosis, characterized by abnormal, recurrent, and delayed reaction to sunlight. It is an immunologically mediated disease that occurs due to delayed hypersensitivity reactions.<sup>[1-4]</sup> It is commonly known as “sunrash” and referred to as “sunallergy” by the patients even though there is no real allergy associated with its pathogenesis.<sup>[5]</sup> It was first described by Robert Willan in 1817 as “eczema solare.” The term “polymorphous light eruption” was coined by Carl Raschin in 1990 and was again described as a common term for prurigo aestivalis and eczema solare by Haxthausen in 1919.<sup>[6]</sup> It is also referred to as dermatographia photogenica, erythema perstans solare, and prurigo aestivalis.<sup>[7]</sup> Polymorphous light eruption is common worldwide but the morphology, distribution, and pigmentary changes are unique in Indian skin which is discussed

in this review. Further, the treatment modalities and the role of sunscreens in Indian context is also discussed.

### Epidemiology

The prevalence of PMLE is around 10–20% in the general population<sup>[8]</sup> with females between 20 and 30 years of age<sup>[6]</sup> and school-going children affected more commonly. PMLE frequently occurs in temperate climates due to a greater proportion of UVA to UVB in these regions. Though the disease is said to be more common in temperate regions, the prevalence of PMLE in India is similar to that reported in the world.<sup>[9]</sup> The proportion of cases varies between 2% and 13.5% across different areas in India.<sup>[10-17]</sup> Most of these studies are hospital-based and may not represent the community prevalence. This probably is an underestimate of the real prevalence.

In Indian studies, a female preponderance was noted. The disease is seen in people who indulge in outdoor activities such as farmers and laborers. In certain studies,

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high incidence was noted in housewives probably because of household activities.<sup>[10,11,18]</sup>

## Seasonal Variation

The wide climatic and geographic variations in India lead to a range of seasonal variation. The PMLE peaks in the month of March and continues into early summer. These are the days when sunshine is longer. Some cases also occur during later winter from January onwards in Northern India probably because of the habit of sunbathing. The second peak was noted in September.<sup>[10,11,14,17]</sup>

## Genetic Predisposition

Polymorphous light eruption occurs in family members in 12–46% of PMLE patients.<sup>[8]</sup> “Familial clustering” in PMLE suggests a genetic etiology.<sup>[10]</sup> In India family clustering was not observed.

## Pathogenesis of PMLE

PMLE occurs due to the interplay of genetic and environmental factors.<sup>[19-22]</sup> The possible mechanisms involved in pathogenesis are given in the form of a chart [Figure 1] which incorporates various factors involved.<sup>[23-27]</sup>

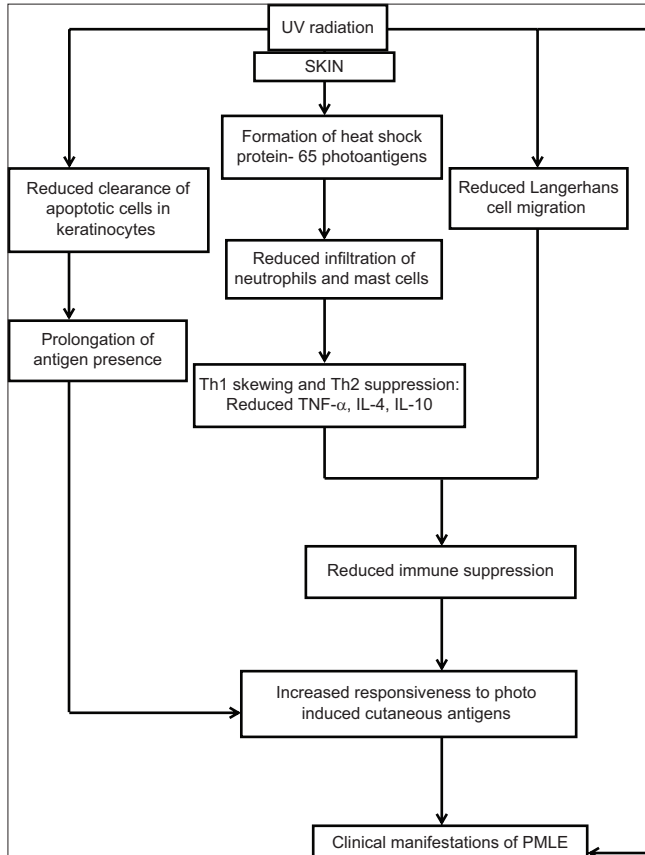


Figure 1: Pathogenesis of PMLE

## Clinical Features

### Photosensitivity

Visible light sensitivity is an important phenomenon in PMLE.<sup>[27]</sup> It typically presents over photo exposed sites within a few minutes of exposure to sunlight. Photosensitivity is the most common symptom that occurs in Indian patients but some experienced a burning sensation on exposure to the sun.

### Morphological lesions

Initially, patchy erythema occurs with pruritus. The primary sites involved are upper chest, “V” area of the neck, upper arms, forearms, back of hands, thighs, and the sides of the face.<sup>[28-34]</sup> Improvement of lesions is noticed during the latter half of the summer season, which is called “hardening.”<sup>[32,34]</sup> Due to repeated daily sun exposure, the face and hands undergo hardening.<sup>[35]</sup>

The action spectrum involves UVA, UVB, and visible light.<sup>[25,36]</sup> There is also an interesting observation of PMLE preferentially involving the sites of hypopigmented scars.<sup>[37]</sup>

PMLE is typically characterized by transient, intermittent, and a delayed response at 30 minutes to several hours after UV light exposure resulting in an abnormal cutaneous response.<sup>[10,15,16]</sup> The eruption usually takes up to two weeks to resolve in the absence of further ultraviolet radiation.<sup>[17]</sup> A typical lesion of PMLE is a hyperpigmented plaque with a hypopigmented rim. Morphologically many variants have been described, hence the name “polymorphous.”<sup>[28]</sup> But one morphology usually predominates in an individual i.e., monomorphous.<sup>[38]</sup> The lesions usually resolve in about 2 weeks in the absence of UV radiation.

The clinical features of PMLE usually follow a characteristic sequence following sun exposure. It starts with itching followed by the appearance of a patchy erythema. Following this, distinct lesions appear which are sparsely distributed initially, which then coalesce to form densely aggregated lesions. Lichenification, scaling, and scarring usually occur as secondary lesions as a result of scratching and rubbing.

The morphological types of lesions noted in the Indian skin are macule, papule, plaque, vesicular, and plaques with lichenification; as isolated lesions or in combinations. In India, the sites of lesions are influenced by the clothing. In women, the forearm and back are exposed and they are commonly involved.<sup>[Figure 2]</sup> The external aspect of the arms and forearms were involved in most of the cases possibly because these parts are placed horizontally while sitting or traveling and receive the maximum exposure.<sup>[18]</sup> <sup>[Figure 3]</sup> On the other hand, the position of the face is vertical while walking or working and only rays fall on the cheek and nose which are affected. <sup>[Figures 4-7]</sup>. Neck may be exposed to the sun if the person is bending



Figure 2: Well-defined plaque on the back



Figure 3: Well-defined plaque on the face

**Table 1: Morphological types of PMLE<sup>[1,5,38-45]</sup>**

Papular
Papulovesicular
Plaque type
Vesiculobullous
Urticarial
Hemorrhagic or purpuric
Eczematous
Confluent edematous swelling of face
Insect bite like (strophula)
Prurigo like
Erythema multiforme like
Pinpoint papular variant
Lichen nitidus like
Lichen planus like
Micropapular variant
PLE sine eruption (erythema or pruritus alone)
Erythema solareperstans
Hydroavacciniforme like
Solar urticarial like
PMLE occurring over hypopigmented scars

forward. [Figure 8]. Covered areas were not affected irrespective of the type of clothing which suggests that it is probably preventable by all types of clothing.

Various morphological types of PMLE have been reported. They are summarized in Table 1.

The unique variants described include the pinpoint papular variant or micropapular variant of PMLE, which presents as multiple, monomorphic pinpoint, closely aggregated skin-colored to hypopigmented itchy lichenoid papules (1–2 mm) on sun-exposed areas[Figure 6].<sup>[39]</sup> Erythema multiforme like PMLE is a less common type of PMLE. It typically presents as target-like lesions in photo distributed areas. This type has to be differentiated from photosensitive erythema multiforme based on histopathology and phototesting results.<sup>[40,41]</sup>

Singh *et al.* described a distinctive pseudovesicular, monomorphic micropapular eruption predominantly involving the nose and adjoining cheeks that affects young to middle-aged people with no gender predilection. It may be photoaggravated in some cases and runs a chronic course. They proposed the term lichenoid pseudovesicular papular eruption of the nose for this condition. This may be variant of PMLE seen in India.<sup>[46]</sup>

### Pigmentary Changes and PMLE

In fairer skin types, the lesions are mostly erythematous papules or plaques and pigmentary changes are unknown.<sup>[38]</sup>

**Table 2: Difference between LE and PMLE<sup>[8,47]</sup>**

	<b>LE</b>	<b>PMLE</b>
Type of lesion	Polymorphic	Monomorphic
Morphology	Maculopapular, vesiculobullous, discoid lesion, periungual lesion	Itchy, grouped small/large erythematous/skin-colored papules, plaques/papulovesicles
Sunlight exposure	Aggravates; can occur in non-exposed areas also	Induces
Photosensitivity	Burning, erythema, edema	Itching, precipitation of lesion
Oral lesion	Erosion/erythematous plaque in >25%	Not seen
Constitutional symptoms	Fever, arthralgia-common	Infrequent
Systemic involvement	Frequent	Not seen
Investigation	ANA positivity	Phototesting



**Figure 4: Facial plaque with a peripheral rim of hypopigmentation**

Most of the Indians belong to type IV to type VI skin and pigmentary changes are commonly seen which varies from hypopigmented to hyperpigmented lesions. [Figures 7 and 8] These pigmentary changes may occur alone or in combination with erythematous or skin-colored lesions. The pigmentary lesions are seen in more than 50% of lesions.<sup>[18]</sup>



**Figure 5: Multiple plaques on the face with a peripheral rim of hypopigmentation**

The pigmentary changes may persist after the lesions subside and have to be differentiated from other causes of hypopigmentation.

### **Differential Diagnosis**

The important differential diagnosis is Lupus erythematosus. There are also a few reports that show that PMLE patients are associated with high titres of ANA and severe photosensitivity progressing into lupus erythematosus.<sup>[47]</sup> The difference between PMLE and LE are summarized in Table 2.

The differential diagnoses for hypopigmented macular PMLE lesions are pityriasis alba, pityriasis versicolor, indeterminate leprosy, previtiligo, post-inflammatory

Hypopigmentation, and nevus anemicus.<sup>[48,49]</sup> In India, dermatophytosis is also an important mimic of PMLE.<sup>[50]</sup>

The infiltrated plaques have to be differentiated from sarcoidosis, Borderline leprosy, Jesse’s lymphocytic infiltrate, lupus vulgaris, granuloma annulare, and granuloma multiforme. Another important photodermatosis which has to be differentiated from PMLE is actinic prurigo.

**PMLE in Children**

PMLE is the most common photodermatosis in childhood.<sup>[35]</sup> It occurs in children during the summer. They are commonly seen over the face, the “V” area of the chest, the back of the neck, and the dorsolateral aspects of the forearms. The face is the common site of occurrence in children. [Figures 6 and 7] The morphological patterns observed include grouped papules, plaques, vesicles, and eczematous plaques.

**Histopathology of PMLE**

The histopathology of PMLE is characterized by the presence of hyperkeratosis, spongiosis with or without the presence of liquefactive degeneration in the epidermis. Dermal changes in the upper and mid dermis include the presence of dense perivascular lymphocytic infiltrate. The dermal infiltrate is composed primarily of T lymphocytes. Sunburn cells are notably sparse or absent.<sup>[25]</sup> The histopathology varies

depending upon the morphological type. Histopathological differential diagnoses for polymorphous light eruption includes reticular erythematous mucinosis, Jessener’s lymphocytic infiltrate, lupus erythematosus, and actinic reticuloid. The histopathology of PMLE can be graded as follows [Table 3].<sup>[17]</sup>

**Phototesting**

In an Indian study, phototesting of patients with PMLE showed that UVB rays were the most relevant wavelength. This increased sensitivity could be due to the geographical conditions, heat, and humidity in the subtropical climate. Photo-patch testing is not helpful in diagnosing PMLE.<sup>[51]</sup>

**Management of PMLE**

The management of PMLE includes both preventive measures and medical management.

Physical protection plays a very important role. The use of an umbrella can be very useful. The patients should wear a



Figure 6: Hypopigmented pinpoint papules on forearm



Figure 7: Hypopigmented lesions on face

**Table 3: Histopathology grading of PMLE<sup>[42]</sup>**

Grading	Epidermis	Basal cell degeneration	Dermis
Diagnostic	Hyperkeratosis/ atrophy/spongiosis	Liquefactive degeneration present	Dense perivascular lymphocytic infiltrate in upper and mid dermis
Possible	Atrophy/spongiosis	Not present	Sparse perivascular lymphocytic infiltrate
Probable	No changes	Not present	Minimal perivascular lymphocytic infiltrate.

**Table 4: Instructions to patients**

Sun protection should be advised a preventive measure during summer months by the following methods  
 Avoid sun exposure between 11.00 am and 3.00 pm.  
 Regular application of broad-spectrum sunscreens of new generation with high SPF  
 Apply sunscreens half an hour before sun exposure.  
 Reapply every 2 h  
 Follow “Teaspoon rule”: 3 ml each for face, arms and 6 ml each for trunk and legs  
 Cover all sun-exposed sites including temples, ears, lateral, and posterior neck.  
 Avoid wearing tight and wet clothes

**Table 5: Treatment ladder of PMLE<sup>[6,8,24,45]</sup>**

First-line  
 Sun avoidance  
 Broad-spectrum sunscreens with patient education on application technique  
 Topical corticosteroids + phototherapy or photochemotherapy  
 Second line  
 Short course corticosteroids for 4-5 days  
 Mild cases: self-conditioning by graduated exposure to sunlight in springtime; severe cases: medically supervised conditioning/desensitization  
 Third line  
 Hydroxychloroquine  
 Systemic immunosuppressants: Azathioprine  
 Omega-3 fatty acids  
 Beta-carotene: 25mg TDS  
 Antioxidants  
 Nicotinamide: 1g TDS  
*E. coli* filtrate  
 Thalidomide

dress covering the exposed areas to provide sun protection. Light-colored clothing is preferred over darker shades. Cotton fabric is recommended for people who work in sun. The patient advice pamphlet is given in Table 4. The various lines of management available are listed in Table 5.

Treatment should be based on the age, sex, occupation, and site of involvement. In Indian context, economic conditions also should be considered. The management designed individually to suit the patients can be successful in the treatment and prevention of the disease.

### Sun avoidance and Sun Protection

Sun avoidance is the only definitive way of preventing PMLE. But this is not possible in a largely agricultural country like India. Sun protection may be a useful alternative. Sun protection should be advised as a preventive measure during summer months with sun avoidance between 11.00 am and 3.00 pm accompanied by regular application

**Figure 8: Hyperpigmented plaque on the neck**

of sunscreens. Patients should also be advised regarding the use of protective clothing and should be informed that a tight and wet fabric increases the transmission of UV light.<sup>[33]</sup>

### Sunscreens

Broad-spectrum sunscreens of the new generation have high SPF and they also provide protection against longer wavelength UVA. Hence, their regular use will provide partial or complete protection against PMLE in almost 90% of patients. In contrast, the old generation sunscreens protect primarily against UVB and does not protect against UVA can provoke PMLE. Patient education regarding proper application technique, quantity to be used, and the necessity to cover all sun-exposed sites including temples, ears, lateral and posterior neck.

In India, most of the sunscreens available are combination products which include physical and chemical sunscreens. They are available in a wide range of sun protection factors. Sunscreens are useful in the prevention of PMLE in patients. But it has been observed that most individuals are not aware of sunscreens and they do not apply sunscreens properly.<sup>[52-54]</sup>

Further application is necessary after sweating. In the Indian subcontinent where humidity is high and most of the patients are laborers, the role of sunscreen is debatable.

### Topical Corticosteroids

High potent topical steroids can be used in patients with mild episodes of PMLE to relieve itch. When used in combination with phototherapy or photo-chemotherapy, they help in reducing the severity and incidence of rash associated with treatment. Further in localized lesions occurring in specific areas, topical steroids are particularly useful.<sup>[4]</sup>

### Topical Antioxidants

A combination of topical antioxidants like alphaglycosylrutin, ferulic acid, and tocopherol acetate was found useful in PMLE. This protects against the inflammation reactions that are most likely to be mediated by the generation of free radicals in the skin.<sup>[54]</sup>

## Systemic Corticosteroids

Systemic steroids are indicated in acute and severe cases. Daily prednisolone in the dosage of 25 mg for 4–5 days at the onset may help to settle the attacks. Prednisolone 1 mg/kg for 1–2 weeks may be initiated during acute and severe exacerbations. Prolonged courses of prednisolone must be avoided due to its potential long term side effects. Therefore, it can be cautiously used in patients with occasional, symptomatic attacks of PMLE.<sup>[55]</sup>

## Photochemotherapy

The frequency and severity of PMLE decreases with summer progression as a result of desensitization phenomenon called “hardening.” This phenomenon is used in the treatment of PMLE. For mild cases, a self-conditioning programme by graduated exposure to sunlight is recommended. For severe cases, medically supervised conditioning is preferential. In Indian context, with increasing summer, the hardening occurs as a natural phenomenon.<sup>[55]</sup>

The mechanism of induction of photoprotection is probably due to the following reasons:

- a. induction of melanization
- b. induction of epidermal thickening
- c. UV induced immunomodulatory and anti-inflammatory effects

## Antimalarials

Hydroxychloroquine 400 mg daily for the first month followed by 200 mg daily for 12 weeks has shown to have a mild benefit in PMLE with a reduction in the severity of the rash. Its membrane stabilizing properties cause proteolytic enzyme inhibition. Hydroxychloroquine 400 mg/day has to be started a few days prior to exposure and it should be reduced to 200 mg/day after optimal drug levels have been reached. In an Indian study, the efficacy of hydroxychloroquine in PMLE has been demonstrated in the trial showing reduction in eruption. Short-term treatment courses with hydroxychloroquine seem to be well-tolerated with a minimized risk of ocular lesions.<sup>[56,57,58,59]</sup>

## Systemic Immunosuppression

Systemic immunosuppressants like azathioprine may be recommended in PMLE in the following situations:

- a. extreme sun sensitivity
- b. intolerance to phototherapy
- c. patients in whom sunscreens are ineffective

The azathioprine was used in the dose of 50mg to 150mg and was effective in a small series of patients but it takes few weeks to act. Cyclosporine has also been found to act in severe cases of PMLE.<sup>[60]</sup>

Thalidomide has been used with some success in certain cases, but the serious adverse side-effects associated with this medication have limited its use.<sup>[61]</sup>

## Conclusion

Polymorphous light eruption is a common disease with varied presentation in the Indian skin. Large scale studies are sparse in this largely neglected disease. It has to be differentiated from its close mimics and appropriately managed. A concord in management between the patient and treating physician is cornerstone for successfully overcoming this disease.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

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