

## Clinico-epidemiological Profile and Photoprotective Behaviour among Patients with Photodermatosis: A Hospital-based Cross-sectional Study

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### DOI

[10.59779/jiomnepal.1357](https://doi.org/10.59779/jiomnepal.1357)

### Submitted

Dec 7, 2024

### Accepted

Mar 27, 2025

### ABSTRACT

#### Introduction

Photodermatoses (PD) encompass a spectrum of skin conditions induced or exacerbated by sunlight. There is limited data on their clinico-epidemiological profile in Nepal. This study aimed to assess the prevalence and study the clinic-epidemiological profile and photoprotective behaviour among patients with photodermatoses.

#### Methods

This hospital-based descriptive cross-sectional study was conducted between September 2023 to August 2024 in the outpatient department of dermatology of a tertiary care centre. Ethical approval was obtained from the Institutional Review Committee. The number of patients diagnosed with PD were determined using Sukraa Hospital Information Management System software, V1.2.24.5 for the calculation of prevalence. Non-probability convenience sampling was used. A total of 69 patients clinically diagnosed with photodermatoses were included in study. Data were collected using a structured proforma and analyzed using Statistical Package for Social Sciences (SPSS) version 16.

#### Results

Prevalence of photodermatitis was 2.24% (338/15116). Polymorphic light eruption was the most common diagnosis 48 (69.57%), followed by photo-contact dermatitis. The prevalence was higher among females 41 (59.42%), with a mean age of 37.21±18.18 years. Most patients were in the 21–30 years age group. The neck 28 (28.28%) and face 20 (20.20%) were the most commonly affected sites, and papules were the predominant lesion morphology 41(42.27%). Only 15 (21.74%) used photoprotective measures, of which sunscreen was the most common 10 (66.67%).

#### Conclusion

Polymorphic light eruption was the most common type of photodermatosis, particularly among females and younger individuals. There was a notably low use of photoprotective measures among patients with PD, particularly sunscreen usage.

#### Keywords

Epidemiology; photosensitivity disorders; photoprotective behaviour; prevalence; skin; sunlight

## INTRODUCTION

Sunlight plays a crucial role in human metabolism and physiology, with Ultraviolet A (UVA) and Ultraviolet B (UVB) rays reaching the Earth's surface.<sup>1</sup> Mostly UV exposure, and occasionally visible light in susceptible individuals can cause photodermatoses (PD),<sup>2</sup> with polymorphic light eruption (PMLE) being the most common.<sup>3</sup> The prevalence of PD is inversely related to latitude: approximately 21% of Scandinavians appear to suffer from PMLE, and 10–15% of people living in the northern United States and the United Kingdom but only 5% of Australians and 1% Singaporeans have the disease.<sup>4</sup> PD are classified into five categories: idiopathic (immune-mediated) conditions like PMLE, juvenile spring eruption, actinic prurigo, hydroa vacciniforme, solar urticaria, and chronic actinic dermatitis; secondary to endogenous or exogenous agents (e.g., drug-induced); photo-exacerbated dermatosis; and genodermatosis.<sup>3</sup>

The prevalence of PD is rising, particularly in subtropical climates like Nepal. While PD is considered mild, it causes significant distress and daily activity limitations for patients.<sup>5</sup> There is limited clinico-epidemiological research on this condition, and no similar studies have been conducted in Nepal.

The aim of this study was to analyze the clinico-epidemiological profile and photoprotective behaviour of patients with photodermatitis at a tertiary care centre.

## METHODS

This hospital-based descriptive cross-sectional study was conducted from September 2023 to August 2024 at the Dermatology outpatient (OPD) department of a tertiary care center. Ethical approval was obtained from the Institutional Review Committee (IRC) of the institution (IRC Reg. No.20-080/81), and written informed consent was obtained from participants aged 16 and above or their guardians for those under 16 years. Anonymity and privacy of patient information were ensured.

The total number of patients attending the Dermatology OPD in one year and the total number of patients diagnosed with PD during that period were determined using Sukraa Hospital Information Management System (SHIMS) software, V1.2.24.5 for the calculation of prevalence. Data were collected using a preformed proforma from all clinically diagnosed cases of PD confirmed by the registered dermatologists based on history and clinical examination. Patients unwilling to participate, those with photo-exacerbated dermatoses, or genodermatosis were excluded.

The sampling technique employed was non-

probability convenience sampling, with a sample size of 66 determined using the formula:

$$N = (Z^2 \times p \times q) / e^2$$

$$= (1.96^2 \times 0.045 \times 0.955) / 0.05^2$$

$$= 66$$

Where:

- N= Minimum required sample size
- Z= 1.96 at a 95% confidence interval (CI)
- p= 4.5% taken as prevalence from a previous study<sup>6</sup>
- q= 1 – p = 95.5%
- e= 5% (margin of error)

The calculated sample size (N) was determined to be 66, however we included 69 patients for this study.

Patient demographics included age, sex, height, weight, Body Mass Index (BMI), occupation, ethnicity, and symptom details such as the number of lesions, duration, time interval before lesion appearance after sun exposure, symptom progression, number of sites involved, side involvement (unilateral or bilateral), associated symptoms, photoprotective behaviours, clothing history, associated conditions, and treatment history. The clinical examination assessed the patient's general condition, lesion morphology, distribution, and affected sites, including oral mucosa, genitalia, hair, and nails.

Data were entered and analysed using the Statistical Package for Social Sciences (SPSS) version 16. Descriptive statistics such as frequency, percentages, and mean±standard deviation were calculated and presented in bar diagrams and pie charts. The point estimate was calculated at a 95% CI.

## RESULTS

Out of the total 15,116 patients who visited outpatient department in one year, 338 were diagnosed with PD, resulting in a prevalence of 2.24% (95% CI: 2.01–2.48). Based on the calculated minimum sample size of 66, we included 69 patients with PD to study their clinico-epidemiological profile.

Among the 69 patients with PD, polymorphic light eruption (PMLE) was the frequently observed condition, affecting 48 (69.57%). This was followed by photo contact dermatitis (PCD), 12 (17.39%) and solar urticaria, 4 (5.80%) (Figure 1).

The prevalence of PD was higher among females, 41 (59.42%), compared to males 28 (40.58%). Age of patients ranged from three months to 85 years, with a mean age of 37.21 ± 18.18 years. Most common age group was 21–30 years, 19 (27.54%) followed by 41–50 years, 15 (21.74%) (Figure 2).

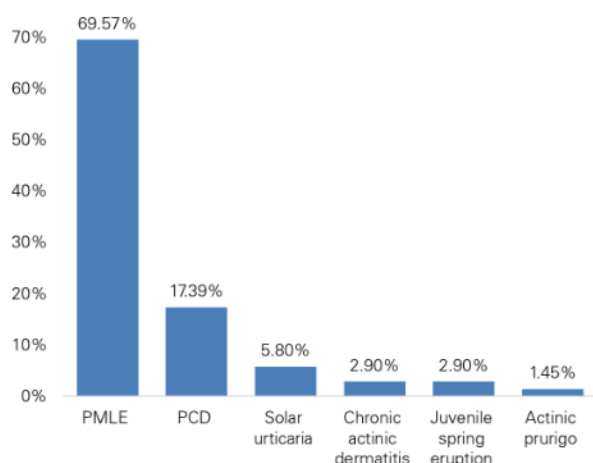


Figure 1. Diagnosis wise distribution of PD (n=69)

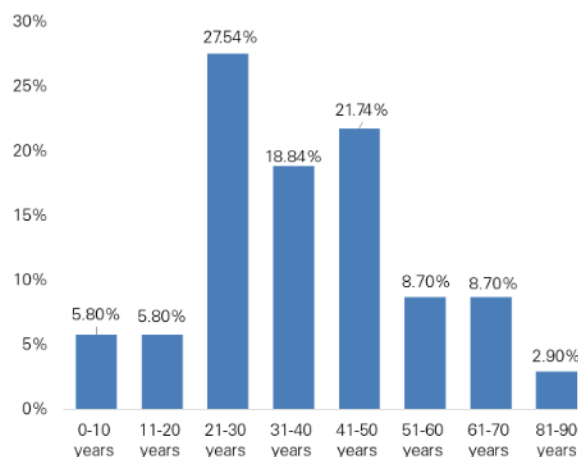


Figure 2. Age distribution of photodermatosis

Table 1. Demographic characteristics in patients with PD (n=69)

Characteristics	Frequency (%)
<b>Occupation</b>	
Housewife	25 (36.23%)
Farmer	10 (14.49%)
Student	9 (13.04%)
Labourer*	5 (7.25%)
Shopkeeper	5 (7.25%)
Unemployed†	4 (5.80%)
Teacher	7 (10.14%)
Office worker‡	4 (5.80%)
<b>Ethnicity</b>	
Tibeto-Mongolians (Magar, Rai, Lama, Gurung, Sherpa)	36 (52.17%)
Brahmin/Chhetri	19 (27.54%)
Newar	6 (8.70%)
Dalits	4 (5.80%)
Others (Singh, Tharu, Shah)	4 (5.80%)
<b>Family history</b>	
Yes	15 (21.74%)
No	54 (78.26%)
<b>BMI category [age&gt;20yr] (n=61)</b>	
Underweight (BMI<18.5)	2 (3.28%)
Normal (BMI=18.5-24.99)	26 (42.62%)
Overweight (BMI>24.9)	33 (54.1%)

\* includes painter, plumber, knitting, paper industry, welding.

† includes child and no occupation.

‡ includes accountant, manager, politician

PD was seen among 25(36.23%) housewives, followed by farmers, 10 (14.49%) and students, 9 (13.04%). In terms of ethnicity, there were 36 Tibeto-Mongolians cases (52.17%), followed by Brahmin/Chhetri 19 (27.54%). Family history was positive in 15(21.73%). Among patients aged over 20 years, PD was more frequently observed in overweight individuals (BMI > 24.9), accounting for 33 cases (54.10%) (Table 1).

Single site was involved in 48(69.56%) followed by two sites, 15(21.73%) and three or more sites, 6(8.69%). Overall, the most commonly affected site was neck in 28 (28.28%) followed by face 20 (20.20%) (Figure 3).

The duration of rash in PD ranged from a few weeks to over a year. Among the patients, 35 (50.72%) reported a rash lasting up to two weeks, 21 (30.43%) had a rash lasting between two weeks and two months, 12 (17.39%) experienced

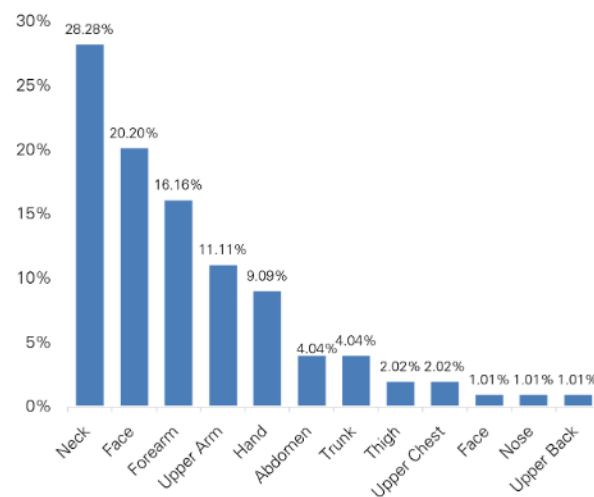


Figure 3. Site of lesion in photodermatosis (n=99)

**Table 2.** Clinical features of patients with PD (n=69)

Clinical features	Frequency (%)
<b>Duration of rash</b>	
≤ 2 weeks	35 (50.72%)
> 2 weeks to ≤ 2 months	21 (30.43%)
>2 months to ≤1 year	12 (17.39%)
> 1 year	1 (1.45%)
<b>Time interval before appearance of lesions</b>	
<30 min	24 (34.78%)
30-60 min	12 (17.39%)
>60 min	33 (47.83%)
<b>Associated symptoms (n=100)</b>	
Itching	58 (58.00%)
Burning	29 (29.00%)
Asymptomatic	7 (10.14%)
Pain	4 (5.80%)
Swelling	2 (2.90%)
<b>Photoprotection measures</b>	
No	54 (78.26%)
Yes	15 (21.74%)
<b>Types of photoprotection measures applied (n=19)</b>	
Sunscreen	10 (66.67%)
Umbrella	3 (20.00%)
Cap	2 (13.33%)
Scarf	2 (13.33%)
Sunglasses	2 (13.33%)
<b>Number of lesions</b>	
1	8 (11.59%)
2	7 (10.14%)
3	11 (15.94%)
4	6 (8.70%)
Multiple i.e. >5	37 (53.62%)
<b>Morphology of lesions (n=97)</b>	
Papule	41 (42.27%)
Plaque	32 (32.99%)
Macule	20 (20.62%)
Excoriation	2 (2.06%)
Scales	1 (1.03%)
Wheal	1 (1.03%)

symptoms persisting for more than two months but less than a year, and 1(1.45%) had a rash lasting over a year.

Itching was the most common symptom among PD patients, reported by 58 individuals (58.00%), followed by a burning sensation in 29 (29.00%), while 7(7.00%) were asymptomatic. Photoprotective measures were used by only 15 (21.74%) patients, while the majority, 54 (78.26%), did not adopt such practices. Among these 15 patients taking photoprotective measures, most used was sunscreen 10 (66.67%) patients followed by umbrella in 3(20.00%) patients and cap, scarf, sunglasses in each of 2 (13.33%) patients.

Regarding lesion patterns, 37(53.62%) patients presented with multiple lesions (>5) followed by 3 lesions 11 (15.94%). Single morphology lesion was seen in 34 (49.27%) while multiple morphology was seen in 35 (50.72%). Overall, the most common lesion morphology was papule 41 (42.27%) followed by plaque 32 (32.99%), macule 20 (20.62%) (Table 2).

## DISCUSSION

The prevalence of PD was 2.24% in this study. This aligns with studies done in Nepal on PD and PMLE prevalence, which reported prevalence of 4-4.5%.<sup>6,7</sup> Study done in Lagos, Nigeria, reported an incidence of 0.4%.<sup>8</sup> lower prevalence was seen in study done in Thailand, with 3 cases per 1000 population.<sup>9</sup> In contrast, higher rates were observed in Western Europe and in the USA, 0–20%.<sup>4</sup> These variations likely reflect differences in Skin type, genetic predisposition, latitude and UV exposure.

PMLE emerged as the most common PD in our study, accounting for 69.57% of cases. Similar trends were reported in studies done in India and Singapore, where PMLE comprised 216 (59.7%), 151(88.82%) and 20(47.6%) of PD cases respectively.<sup>10,11,12</sup> Ethiopia also reported PMLE as the most frequent PD, constituting 80% of cases.<sup>13</sup>

PD was more prevalent in females 41(59.42%) compared to males 28 (40.58%), consistent with findings from India and Nepal.<sup>7,11</sup> Western studies have similarly documented a female predominance in PMLE, with onset commonly occurring in the second or third decade of life.<sup>4,14</sup> This may be due to greater UV sensitivity, hormonal factors, or differences in sun exposure and protection practices. A female hormone 17β-estradiol inhibits UV radiation-induced suppression of the contact hypersensitivity response, which is mediated by the release of immunosuppressive cytokines like IL-10 from keratinocytes, could explain the higher PMLE risk in females compared to males.<sup>15</sup>

The mean age of patients in our study was 37.21±18.18 years, with the highest prevalence in the 21–30 years age group 19(27.54%). Comparable age distributions were observed in Indian studies, where 55.8% of PD cases occurred in the 21–40

years age group.<sup>10,11</sup> Western populations also report PMLE onset typically in the second or third decade.<sup>4</sup> This younger age predominance may reflect higher UV exposure due to outdoor activities and work.

The most common occupation associated was housewives, 25 (36.23%), followed by farmers 10 (14.49%) and students 9 (13.04%). This pattern aligns with trends observed in Indian studies, where housewives 140 (38.70%) and students 64 (17.7%) were among the most commonly affected groups with PD.<sup>10,11</sup> In other studies, most of the PD patients were housewives, students and farmers like our findings.<sup>16,17,11</sup> In most cases, their exposure to sunlight was intermittent and for short durations. Increase incidence in housewives could be attributed to exposure to indoor heat while cooking and also visible light exposure. While in students and farmers, it might be attributed to increased sun exposure.<sup>17,18</sup>

Ethnic analysis revealed a higher prevalence among Tibeto-Mongolians (52.17%) compared to Brahmin/Chhetri (27.54%). These differences could be attributed to genetic predisposition, skin type, and lifestyle factors, consistent with findings from similar PD studies.<sup>10</sup>

Our study showed positive family history in 15 (21.74%) similar to study done in India.<sup>16,17</sup> but was higher 182 (46%) in study done in Sweden.<sup>19</sup> Higher BMI was observed in adults with PD, with 54.10% of overweight individuals (BMI > 24.9) affected, compared to 42.62% of those with normal BMI. This is linked with study showing lower incidence of tanning dependence among obese.<sup>20</sup> Clinically, these findings underscore the importance of considering BMI in PD management and prevention strategies. Further studies with larger sample size are needed to confirm this relationship and explore underlying mechanisms.

Regarding rash duration, most patients 35(50.72%) experienced symptoms lasting up to 2 weeks, aligning with studies reporting transient rashes lasting weeks to months, particularly in darker-skinned populations.<sup>10</sup> Itching 58(58.00%) was the most common symptom, followed by burning sensation 29(29.00%). Similar findings were noted in studies from India, where pruritus and burning were the predominant complaints.<sup>10,21</sup> Only 15(21.74%) of patients reported using photoprotective measures, mainly sunscreen in 10 (66.67%), consistent with reports of low sunscreen usage (14%) in patients with PMLE in one study.<sup>21</sup>

The most common lesion type was papules 41 (42.27%), followed by plaques 32 (32.99%) and macules 20 (20.62%), comparable to findings in previous studies where papules and plaques predominated.<sup>10,17</sup> Lesion onset showed variability among PD types. In PMLE, 25 (52.08%) developed rashes within 60 minutes, while 23(47.92%) had

delayed onset. Across all PD cases, 36(52.1%) experienced lesions within the first hour, indicating variability in reaction times among different types of PD. This variability should be considered during clinical diagnosis and patient counseling. Similar rapid onset was observed in studies on solar urticaria, where lesions appeared within minutes to an hour.<sup>22</sup>

Neck was the most commonly affected site 28 (28.28%), followed by the face 20 (20.20%). This aligns with Ethiopian studies identifying the face and neck as frequent sites in PMLE.<sup>11,3</sup> Studies from India reported forearms and arms as the most commonly affected areas.<sup>10</sup> These findings highlight that PD is more common in sun exposed areas.

This study has few limitations. First, it was conducted in a single-center setting, which may limit the generalizability of the findings to other regions. Additionally, data collection relied on clinical diagnosis, which could be subject to observer bias. Future multi-center studies with more detailed demographic data are recommended to confirm these findings.

## CONCLUSION

PD are relatively common conditions, with PMLE being the most common type, particularly among females and younger individuals. There is a notably low use of photoprotective measures among patients with PD, particularly sunscreen usage, which should be addressed through public health campaigns. The relationship between higher BMI and PD suggests the need for further studies to explore the role of systemic factors in the condition. Further multicentric studies with larger sample are needed to validate these findings.

## FINANCIAL SUPPORT

The author(s) did not receive any financial support for the research and/or publication of this article.

## CONFLICT OF INTEREST

The author(s) declare that they do not have any conflicts of interest with respect to the research, authorship, and/or publication of this article.

## AUTHOR CONTRIBUTIONS

Research concept: MB; Research design: MB, SP; Literature review: MB, SD, SS, DPT, SP; Data collection: AR, DPT, SP; Data analysis: SD, SS, SP; Statistical analysis: SD, DPT; Manuscript preparation: MB, AR, SS. All authors read and agreed with the final manuscript.

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