RESEARCH PAPER

Clinical Outcomes of Bath Psoralen–Ultraviolet a Photochemotherapy in Moderate-To-Severe Psoriasis: A Retrospective Observational Study from A Tertiary Care Centre In South India

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ABSTRACT

Background: Bath psoralen–ultraviolet A (bath-PUVA) photochemotherapy is an established treatment for moderate-to-severe psoriasis, particularly in patients who are unsuitable for systemic therapy or oral PUVA. Despite the increasing availability of biologic agents, bath-PUVA remains an effective therapeutic option in selected patients.

Objective: The present study aimed to evaluate the clinical efficacy, safety, treatment outcomes, and remission duration of bath-PUVA therapy in patients with moderate-to-severe psoriasis treated at a tertiary care centre.

Materials and Methods: This retrospective observational study included 60 adult patients with psoriasis who received bath-PUVA therapy between January 2021 and December 2023. Demographic characteristics, disease duration, body surface area (BSA) involvement, concurrent immunomodulatory therapy, treatment frequency, cumulative bath-PUVA sessions, adverse events, and remission duration were extracted from medical records. Statistical analysis was performed using SPSS version 26.0. Continuous variables are presented as mean ± standard deviation, while categorical variables are expressed as frequencies and percentages. Statistical significance was considered at $P < 0.05$.

Results: Among the 60 patients, 49 (81.7%) were male and 11 (18.3%) were female, with a mean age of 42.75 ± 13.62 years. Before treatment, 34 (56.7%) patients had severe disease and 25 (41.7%) had moderate disease based on BSA involvement. Following bath-PUVA therapy, 34 patients achieved mild disease (<10% BSA), 18 had moderate disease, and only 8 remained in the severe category. Most patients underwent three bath-PUVA sessions per week, with a mean of 20 treatment sessions. Concurrent immunomodulatory therapy, particularly apremilast, was associated with favourable clinical outcomes. Adverse events were infrequent and limited to mild erythema and phototoxic reactions.

Conclusion: Bath-PUVA therapy remains a safe, effective, and well-tolerated treatment modality for patients with moderate-to-severe psoriasis, particularly for individuals who are unsuitable for systemic therapy or oral PUVA. The treatment demonstrated substantial improvement in disease severity with minimal adverse effects, supporting its continued role in contemporary psoriasis management.

Keywords: Bath-PUVA, psoriasis, photochemotherapy, ultraviolet A, body surface area, retrospective study.

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INTRODUCTION

Psoriasis is a chronic, immune-mediated inflammatory disorder affecting approximately 2–3% of the global population. It is characterized by well-demarcated erythematous plaques with adherent silvery scales and is associated with substantial physical, psychological, and socioeconomic burden. The disease results from a complex interaction between genetic susceptibility, environmental triggers, and immune dysregulation, particularly involving the interleukin (IL)-23/IL-17 axis. Activation of T-helper 17 (Th17) lymphocytes and subsequent production of pro-inflammatory cytokines, including IL-17 and IL-22, promote keratinocyte hyperproliferation and chronic cutaneous inflammation. [1–4]

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Photochemotherapy with psoralen combined with ultraviolet A (PUVA) has long been recognized as an effective treatment for moderate-to-severe psoriasis. Conventional oral PUVA, although effective, is associated with systemic adverse effects including gastrointestinal intolerance, phototoxicity, ocular complications, and potential drug interactions. Bath-PUVA was developed to overcome many of these limitations by delivering psoralen topically before UVA irradiation. Because systemic absorption of psoralen is minimal, bath-PUVA offers effective local photosensitization while reducing systemic toxicity. [5]

The introduction of narrowband ultraviolet B (NB-UVB) phototherapy and biologic therapies has reduced the routine use of bath-PUVA in recent years. Nevertheless, bath-PUVA continues to play an important role in selected patients, particularly those with contraindications to systemic immunosuppressive therapy, intolerance to oral PUVA, inadequate response to NB-UVB, or limited access to biologic agents. Several studies have demonstrated that bath-PUVA achieves clinical efficacy comparable to or greater than oral PUVA while requiring lower cumulative UVA doses and producing fewer systemic adverse effects. [6_17]

Evidence regarding the real-world effectiveness of bath-PUVA in the Indian population remains limited. Moreover, data describing treatment outcomes in patients receiving concomitant immunomodulatory therapy are scarce. Therefore, this retrospective observational study was undertaken to evaluate the clinical efficacy, safety, remission patterns, and treatment outcomes of bath-PUVA therapy in patients with moderate-to-severe psoriasis managed at a tertiary care teaching hospital in South India.

MATERIALS AND METHODS

Study Design and Setting

This retrospective observational study was conducted in the Department of Dermatology at a tertiary care teaching hospital in South India. The study evaluated the clinical outcomes of bath psoralen–ultraviolet A (bath-PUVA) photochemotherapy in patients with moderate-to-severe psoriasis. Institutional Ethics Committee approval was obtained before data collection (IEC No. 19/2024). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Study Population

Medical records of adult patients with psoriasis who underwent bath-PUVA therapy between January 2021 and December 2023 were retrospectively reviewed.

Patients aged 18 years or older of either sex who received at least two bath-PUVA treatment sessions were eligible for inclusion.

Inclusion Criteria

Patients fulfilling all the following criteria were included:

- Age ≥18 years
- Clinical diagnosis of moderate-to-severe psoriasis
- Received bath-PUVA therapy during the study period
- Complete medical records available for analysis

Exclusion Criteria

Patients were excluded if they:

- Were younger than 18 years
- Were pregnant or lactating
- Received fewer than two bath-PUVA sessions
- Had active cutaneous infections
- Had incomplete clinical records

Bath-PUVA Treatment Protocol

Psoralen Bath

A stock solution containing 0.5% (w/v) crystalline 8-methoxypsoralen (8-MOP) dissolved in 95% ethanol was prepared. The solution was diluted with warm tap water to achieve a final concentration of 0.0003% (w/v) in approximately 100 L of water for whole-body immersion.

Patients immersed the affected skin for 15–20 minutes, after which the skin was gently dried. UVA irradiation was administered immediately following the bath.

UVA Irradiation

Whole-body UVA irradiation was delivered using a Waldmann PUVA 1000 phototherapy unit equipped with 26 UVA fluorescent lamps (315–400 nm) with an irradiance of approximately 9 mW/cm².

Patients were instructed to wear UVA-protective goggles throughout treatment and to cover the genital area appropriately.

Irradiation Schedule

Bath-PUVA sessions were administered two or three times weekly at intervals of 48–72 hours, depending on patient tolerance and clinical response.

Treatment commenced with a UVA dose of 0.5 J/cm², which was increased by a maximum of 0.5 J/cm² per session according to individual erythemal response.

Data Collection

The following variables were extracted from patients' medical records: Age, sex,disease duration, clinical subtype of psoriasis, initial site of involvement, family history, baseline body surface area (BSA), post-treatment BSA, number of bath-PUVA sessions, frequency of treatment, concurrent systemic therapy, cumulative UVA dose, adverse events, duration of remission

Outcome Measures

The primary outcome was the change in disease severity based on body surface area (BSA) involvement following bath-PUVA therapy.

Secondary outcomes included: Frequency of adverse events, effect of concurrent immunomodulatory therapy,

association between treatment frequency and clinical improvement, duration of clinical remission

Statistical Analysis
Statistical analysis was performed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA).

Continuous variables were tested for normality using the Shapiro–Wilk test and are presented as mean ± standard deviation (SD) or median (interquartile range) where appropriate.

Categorical variables are expressed as frequencies and percentages.

Associations between categorical variables were analysed using the Chi-square test or Fisher's exact test when appropriate.

A P-value <0.05 was considered statistically significant.

RESULTS

Baseline Characteristics
A total of 60 patients with moderate-to-severe psoriasis who underwent bath-PUVA therapy were included in this study.

The study population comprised 49 (81.7%) males and 11 (18.3%) females, with a male-to-female ratio of 4.5:1. The mean age was 42.75 ± 13.62 years (range, 18–85 years). Forty-two (70.0%) patients were between 18 and 50 years of age, while 18 (30.0%) were older than 50 years. The median disease duration was 4 years (range, 1–35 years).

Disease Characteristics
Chronic plaque psoriasis was the predominant clinical subtype, accounting for 54 (90.0%) patients. Other clinical variants included erythrodermic psoriasis in 3 (5.0%) patients, generalized pustular psoriasis in 2 (3.3%) patients, and psoriatic arthritis in 1 (1.7%) patient.

The scalp was the most common initial site of involvement, affecting 28 (46.7%) patients, followed by the trunk and chest (20, 33.3%) and the limbs (12, 20.0%). None of the patients had drug-induced psoriasis.

Baseline Disease Severity
Before initiation of bath-PUVA therapy, 25 (41.7%) patients had moderate disease, whereas 34 (56.7%) had severe disease based on BSA involvement.

Disease severity differed significantly across age groups ($P < 0.001$) (Table 1). Severe disease was more frequently observed among patients aged 18–50 years, whereas comparatively fewer patients older than 50 years had extensive BSA involvement. Only one patient belonged to the mild disease category before treatment.

Bath-PUVA Treatment Characteristics
During the study period, patients underwent a total of 679 bath-PUVA treatment sessions.

The mean number of treatment sessions per patient was 20, with a range of 2–142 sessions.

Treatment was initiated with a UVA dose of 0.5 J/cm², which was gradually increased according to clinical response, reaching a maximum dose of 10 J/cm². The mean maintenance dose was 2.75 J/cm².

Safety
Bath-PUVA therapy was generally well tolerated. Only six adverse events were recorded during the study period. Phototoxic reactions occurred in two (3.3%) patients and mild erythema was observed in four (6.7%) patients. No severe adverse events or treatment discontinuations due to toxicity were documented.

Clinical Response
Following completion of bath-PUVA therapy, substantial improvement in disease severity was observed. Thirty-four (56.7%) patients achieved mild disease (<10% BSA), 18 (30.0%) had moderate disease, while only 8 (13.3%) remained in the severe disease category (Table 2). Patients aged 35–50 years demonstrated the greatest improvement, with the highest proportion achieving mild disease after treatment.

Concomitant Immunomodulator Therapy
Fifty (83.3%) patients received concomitant systemic immunomodulatory therapy during bath-PUVA treatment. Apremilast was the most frequently prescribed agent (20 patients), followed by methotrexate (17 patients) and combined methotrexate plus apremilast (11 patients). One patient each received acitretin and secukinumab.

Among patients receiving apremilast, most achieved mild disease (<10% BSA), whereas severe disease was more common among patients treated with methotrexate (Table 3). The 10 patients managed with bath-PUVA monotherapy all achieved disease control with BSA <10% following treatment.

Treatment Frequency
Thirty-eight (63.3%) patients received bath-PUVA three times per week, whereas 16 (26.7%) underwent treatment twice weekly. Most patients completed 2–20 treatment sessions during the study period. Clinical improvement was greater among patients receiving three sessions per week, although patients treated twice weekly also demonstrated satisfactory disease control. Notably, no patient receiving twice-weekly treatment remained in the severe disease category following therapy (Table 4).

Remission
Most patients (86%) completed between 2 and 20 bath-PUVA sessions. A remission period of 3 months was most frequently observed, followed by 1 month.

Patients who underwent more than 20 treatment sessions experienced remission periods ranging from 2 to 5 months. One patient who received more than 100 treatment sessions over three years remained in remission for 4 months.

Four patients were lost to follow-up, and therefore their remission duration could not be determined.

DISCUSSION

This retrospective observational study evaluated the clinical efficacy and safety of bath psoralen–ultraviolet A (bath-PUVA) photochemotherapy in 60 patients with moderate-to-severe psoriasis treated at a tertiary care teaching hospital. The findings demonstrated that bath-PUVA was associated with a substantial reduction in disease severity, with more than half of the patients achieving mild disease (<10% BSA) after treatment. The therapy was well tolerated, with only mild and reversible adverse events observed during the study period.

The demographic characteristics of our study population are consistent with previous reports, with a clear male predominance (81.7%) and a mean age of 42.75 years. Chronic plaque psoriasis was the most common clinical subtype, accounting for 90% of cases, which agrees with the established epidemiology of psoriasis. Similar findings have been reported by Griffiths and Barker and subsequent epidemiological studies, where plaque psoriasis represented the predominant clinical presentation. [1]

Before treatment, most patients had moderate-to-severe disease based on body surface area involvement. Following bath-PUVA therapy, a marked improvement in disease severity was observed, with a substantial proportion of patients achieving mild disease. These findings support the continued effectiveness of bath-PUVA despite the increasing availability of biologic therapies.

Our results are consistent with the multicentre randomized study by Berneburg et al., which demonstrated that bath-PUVA was at least as effective as conventional oral PUVA while requiring lower cumulative UVA exposure.[9] Similarly, Salem et al. reported superior clinical improvement with bath-PUVA compared with narrowband UVB phototherapy in patients with psoriasis.[13] Together, these studies reinforce the role of bath-PUVA as an effective treatment option, particularly in patients who are unable to receive systemic therapies.

Most patients in our cohort received concurrent immunomodulatory therapy, predominantly apremilast and methotrexate. Patients treated with apremilast generally demonstrated better post-treatment BSA outcomes than those receiving methotrexate alone. Although the present study was not designed to compare the efficacy of individual systemic therapies, these observations suggest that concomitant immunomodulatory treatment may enhance clinical response when used alongside bath-PUVA. Prospective comparative studies are required to confirm these findings.

Treatment frequency appeared to influence clinical outcomes. Patients receiving bath-PUVA three times weekly showed greater improvement in BSA than those treated twice weekly. However, interpretation of this finding should be cautious because treatment allocation was based on routine clinical practice rather than randomization, and potential confounding factors such as baseline disease severity and treatment adherence could not be controlled.

Bath-PUVA therapy was well tolerated in our study. Only two patients developed phototoxic reactions, while four experienced mild erythema. No serious adverse events or treatment discontinuations due to toxicity were recorded. These findings are consistent with previous studies demonstrating that topical administration of psoralen minimizes systemic exposure and reduces the gastrointestinal and ocular adverse effects commonly associated with oral PUVA. [15–17]

An additional finding of this study was the duration of clinical remission following therapy. Most patients remained in remission for approximately three months after treatment completion. Although remission duration varied according to the number of treatment sessions received, interpretation should be cautious because follow-up periods were not uniform and four patients were lost to follow-up. Prospective longitudinal studies with standardized follow-up are needed to better characterize long-term remission after bath-PUVA therapy.

Despite advances in biologic therapies, bath-PUVA continues to have an important role in clinical practice, particularly in resource-limited settings where access to biologics may be restricted because of cost or availability. It also remains a valuable therapeutic option for patients with contraindications to systemic immunosuppressive agents, intolerance to oral PUVA, or inadequate response to narrowband UVB phototherapy.

Strengths

The present study provides real-world clinical data on bath-PUVA therapy in an Indian tertiary care setting. It includes patients treated in routine clinical practice, reflects contemporary management strategies involving concomitant immunomodulatory therapy, and evaluates both treatment response and safety outcomes.

LIMITATIONS

This study has several limitations. First, its retrospective design introduces the possibility of selection and information bias because data were obtained from existing medical records. Second, the study was conducted at a single centre with a relatively small sample size, which limits the generalizability of the findings. Third, disease severity was assessed using body surface area rather than the Psoriasis Area and Severity Index (PASI), limiting comparison with studies that use PASI as the primary outcome. Finally, the absence of a control group and variability in concomitant systemic therapies preclude definitive conclusions regarding the independent efficacy of bath-PUVA.

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CONCLUSION

Bath psoralen–ultraviolet A photochemotherapy remains a safe, effective, and well-tolerated treatment for patients with moderate-to-severe psoriasis. In this retrospective

study, bath-PUVA was associated with significant improvement in body surface area involvement, a low incidence of adverse events, and satisfactory periods of clinical remission. The treatment appears particularly valuable for patients who are unsuitable for systemic therapy, have contraindications to oral PUVA, or have inadequate responses to narrowband UVB phototherapy. Although biologic agents have transformed psoriasis management, bath-PUVA continues to represent a practical and effective therapeutic option, especially in resource-constrained settings. Larger prospective multicentre studies with standardized outcome measures are warranted to further define its role in contemporary psoriasis management.

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Table 1. Baseline body surface area (BSA) severity according to age group before initiation of bath-PUVA therapy

Age group	Mild	Moderate	Severe	Total
18–34	1	11	9	21
35–50	0	7	14	21
>50	0	7	11	18
Total	1	25	34	60

Footnote: Disease severity differed significantly among age groups ($P < 0.001$).

Table 2. Body surface area (BSA) severity after completion of bath-PUVA therapy

Age group	Mild	Moderate	Severe	Total

18–34	11	5	5	21
35–50	16	4	1	21
>50	7	9	2	18
Total	34	18	8	60

Footnote: Disease severity improved following bath-PUVA therapy.

Table 3. Association between concomitant immunomodulatory therapy and post-treatment BSA severity

Therapy	Mild	Moderate	Severe	Total
Methotrexate	8	5	4	17
Apremilast	11	7	2	20
Acitretin	1	0	0	1
Secukinumab	0	1	0	1
Methotrexate + Apremilast	3	7	1	11

Footnote: Ten additional patients received bath-PUVA monotherapy and achieved BSA <10%.

Table 4. Association between bath-PUVA treatment frequency and post-treatment BSA severity

Sessions	Frequency	Mild	Moderate	Severe
2–20	Twice weekly	8	5	0
	Thrice weekly	12	14	6
>20	Twice weekly	2	0	0
	Thrice weekly	4	1	1
>100	Twice weekly	0	1	0
	Thrice weekly	Nil	Nil	Nil

Footnote: Six patients received once-weekly maintenance therapy and were not included in the comparative analysis.