Skin of Color Specifications in Visible Light Phototherapy for Immune-Mediated Dermatological Conditions: Psoriasis, Vitiligo, and Atopic Dermatitis

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Introduction

Background & Significance

Managing chronic skin conditions like psoriasis, atopic dermatitis, and vitiligo remains challenging due to limited treatment efficacy and risks associated with traditional therapies like UV phototherapy.[1,2,3] Visible light therapy has emerged as a promising alternative; however, phototherapy effects have been shown to vary based on skin color.[2,3,4,5] Despite these known differences, dermatological research continues to lack adequate representation of patients with skin of color (SOC).[6]

Observation Leading to Focus Question

- Visible light (VL) therapy (400-700 nm) modulates inflammation and promotes cellular differentiation making it a promising treatment for psoriasis, vitiligo, and atopic dermatitis.[4]
- VL affects dark and light skin different with greater hyperpigmentation found in darker skin vs. immediate erythema present in lighter skin.[3,5]
- Accurate skin classification and SOC representation are essential to fully understand visible light's therapeutic potential across diverse populations.[6]

Focus Question: (1) Are patients with skin of color (SOC) represented in clinical trials evaluating visible light therapy for immune-mediated dermatological conditions? (2) Do these studies differentiate data or include specific considerations for SOC patients compared to lighter skin?

Methods

Protocol

Scoping review conducted using JBI methodology and reported in accordance with PRISMA-ScR.

Databases Searched & Search Strategy

- Database: PubMed and CENTRAL Cochrane (searched February 2025)
- Keywords: "visible light," "blue light," "red light," "phototherapy," "psoriasis," "vitiligo," "atopic dermatitis"

Inclusion & Exclusion Criteria

- Included: Randomized controlled trials, clinical trials, studies involving visible light therapy (400-700 nm) for atopic dermatitis, psoriasis, or vitiligo.
- Excluded: Non-English publications, non-human studies, systematic reviews, scoping reviews, case reports, studies not involving visible light therapies.

Screening & Data Extraction

- Titles and abstracts were screened independently by two reviewers.
- Full texts were assessed against inclusion criteria; disagreements were resolved by a third reviewer.
- A standardized data extraction form was used to collect: skin condition, therapy type, wavelength/frequency/duration, outcome measures, and reporting on skin color or race.

Results

Figure 1. PRISMA diagram of study screening and selection.

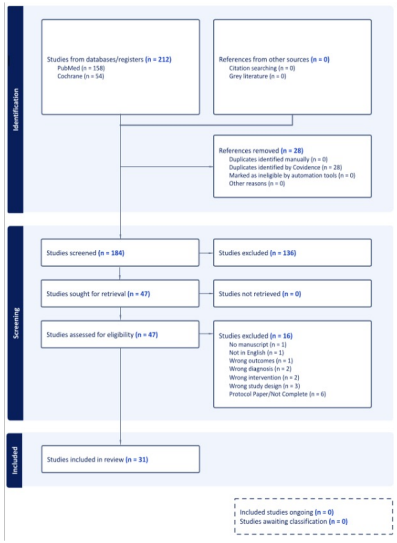


Table 1. Summary of data on whether skin color is mentioned in studies.

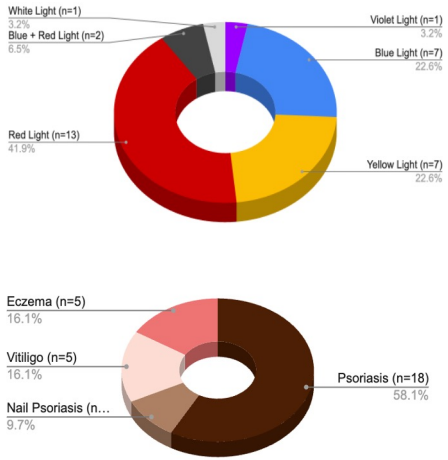
	All Included Studies	Studies Including Psoriasis	Studies Including Vitiligo	Studies Including Atopic Dermatitis
Total	31	21	5	5
Reported Skin Color in the Methods	2 (7%)	1	1	0
Reported Skin Color throughout the study (excluding Methods)	2 (7%)	1	1	0
Reported Race or Ethnicity	1 (3%)	1	0	0
Reported Nationality	4 (12%)	1	2	1
Used a Skin Classification System	5 (16%)	3	1	1
Reported an Image in the Paper	24 (77%)	16	4	4

Only **~14%** of studies mentioned **skin color** in methods or analysis.

77.4% included participant **skin images.**

Of those, **75%** showed **light skin types** (Fitz 1&2).

Figure 2. Characteristics of included experimental studies. (n=31)



Discussion

Limitations:

- The primary focus on psoriasis limits the attention given to other dermatologic conditions, which may disproportionately affect individuals with skin of color (SOC).[6] Further, focus on red light studies limits the understanding of other VL wavelengths.
- Lack of a standardized/objective skin rating scale limits accurate classification and representation of SOC.
- Excluded case series/reports that did not fit inclusion criteria but could still provide insight into phototherapy in SOC.
- Minimal analysis of how visible light interacts with melanin and its impact on pigmentation in SOC.

Implications for Future Research:

- Prioritize diverse participant populations recruitment and conduct subgroup analyses to explore how light therapy affects different skin types. Include diverse clinical imagery for findings.
- Use standardized skin classification systems like the Fitzpatrick scale or adopt AI-based skin classification systems to improve inclusivity in dermatologic research.
- Expand exploration to include a broader range of light wavelengths for a more comprehensive understanding of efficacy across skin tones.

Conclusion

This scoping review examined current research on visible light (VL) therapy for immune-mediated dermatologic conditions, with a focus on SOC.

Q(1): Are patients with skin of color (SOC) represented in clinical trials evaluating visible light therapy for immune-mediated dermatologic conditions?

A: No, SOC patients are underrepresented in current visible light therapy studies. Most trials lack diversity in participant skin tones.

Q(2): Do these studies differentiate data or include specific considerations for SOC compared to lighter skin?

A: Rarely. Few studies perform subgroup analyses or address how VL therapy may uniquely affect SOC. Visual representation is also limited.

By addressing this gap, we hope that future research reflect the full spectrum of skin tones. Prioritizing diversity in study design, analysis, and representation is not just a scientific necessity, it's a call to advocacy for health equity in dermatology.

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