

Unveiling Artificial Intelligence's Diagnostic Power and Challenges in Dermatology for Skin of Color: A Review

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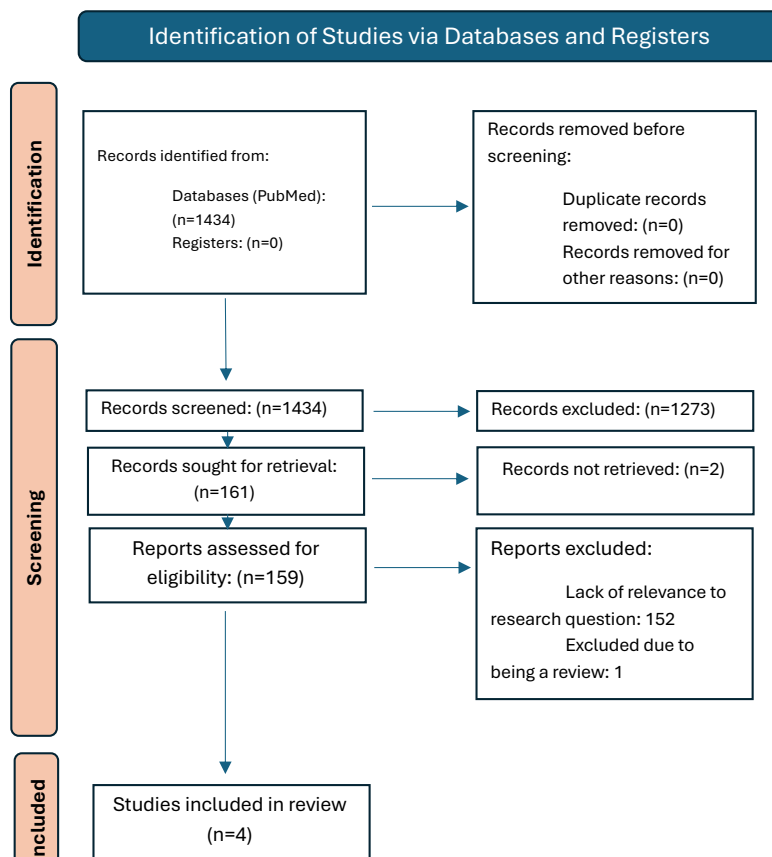
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INTRODUCTION

Artificial intelligence (AI) has the ability to revolutionize the diagnostic outcomes and accessibility of dermatology.¹ This study scrutinizes the application of AI in dermatology, specifically assessing its effectiveness in diagnosing skin conditions in skin of color (SOC), while synthesizing the emerging trends of dermatologic AI and SOC,

thus serving as a resource to address the bias toward lighter skin tones—a fundamental shortcoming of AI—which is vastly understudied.² The goal is to help guide researchers and developers on ways to create more inclusive tools for equitable diagnostic use, highlighting limitations and providing insight into ways to mitigate bias and make change toward equitable and reliable AI dermatologic outcomes.

FIGURE 1. This figure shows how the authors picked the studies used in this review.



Four authors jointly analyzed posts via PubMed from December 10th, 2023 to May 21st, 2024. The keyword searches included: (Artificial Intelligence dermatology). 1434 articles were identified, and ultimately 4 were included in the review.

An analysis of the sources in this review found significant disparities in the ability of AI models to diagnose skin disease in individuals of darker skin tones (Fitzpatrick skin types 5 and 6) when compared to individuals with lighter skin tones. An inherent bias is revealed in two studies as evidenced by AI originally trained with lighter skin toned images having lower metric performance in the areas of sensitivity, specificity, positive predictive value, negative predictive value, F1 score, and area under the receiver operating characteristic curve when diagnosing basal cell carcinoma and melanoma in images of darker skin tones as compared to lighter skin tones.

Recognizing this disparity, researchers have found that the use of unsupervised image-to-image translation in medical AI image recognition models by synthetically darkening light skin images while retaining lesion-specific features has the potential to improve accuracy across diverse skin tones. Early findings show that these modified images can improve model adaptability for darker skin tones and pave an innovative path for enhancing AI diagnostic equity.

A major limitation remains the limited availability of skin lesions from individuals with darker skin types. Large, diverse datasets are crucial for closing the performance gap. One study aimed to address this gap by introducing a resource called the Diverse Dermatology Data Set Images, finding that AI models trained with this data set performed better on darker skin types.

AI shows great promise for the future of dermatology; however, a key challenge identified is the performance disparity of AI algorithms on darker skin tones, likely due to biased training datasets and a lack of clinical images depicting darker skin tones. This affects diagnostic reliability and raises ethical concerns about healthcare equity, as AI tools may perpetuate disparities in racially diverse populations if not properly addressed.

Future research is needed and should focus on expanding datasets to better represent diverse skin tones and exploring techniques such as unsupervised image-to-image translation to improve AI performance in racially diverse contexts. The emerging evidence in the field of AI and SOC addressed in this review underscores data-driven avenues for creating regulatory standards and reducing diagnostic inequity in dermatology.

DISCLOSURES

The authors have no conflict of interest to declare.

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