



Contents lists available at ScienceDirect

International Journal of Women's Dermatology

journal homepage:



Research Letter

Skin of color lacks representation in medical student resources: A cross-sectional study



Dear Editors,

Visual diagnostic skills and pattern recognition in different skin tones are necessary for accurate diagnoses of dermatologic conditions in diverse patient populations. Prior studies have demonstrated large disparities between the representation of skin types among dermatology training materials (Alvarado and Feng, 2020; Ebede and Papier, 2006). Images of skin of color (SoC) are under-represented in American Academy of Dermatology (AAD) annual meetings, medical textbooks, medical school curricular material, and web-based medical resources (Adelekun et al., 2021; Alvarado and Feng, 2020; Ebede and Papier, 2006). Furthermore, medical students lack training on how cutaneous pathology presents in different skin tones and are not as skilled in diagnosing dermatologic manifestations in darker skin compared with lighter skin (Alvarado and Feng, 2020; Adelekun et al., 2021; Fenton et al., 2020). Over the last decade, there has been an increase in the use of supplementary learning tools in medical school. Therefore, we sought to investigate the diversity of dermatology images among these commonly used medical school resources.

The following resources were comprehensively searched for photographs of dermatologic lesions: Amboss, Boards and Beyond, Firecracker, First Aid, Pathoma, and the AAD Basic Dermatology Curriculum. Images without a clear background skin type were excluded. One author classified each image as non-SoC (white to beige skin tones, corresponding to Fitzpatrick skin types I–III) or SoC (brown to black skin tones, corresponding to Fitzpatrick skin types IV–VI), and extracted information on the disease process based on the photo caption. A second author repeated this process in 10% of images randomly selected from each source, and inter-rater reliability was calculated using Cohen's kappa, which indicated almost perfect agreement ($\kappa = 0.94$ –1.0).

Of the 1123 images, 14.9% were classified as SoC (Table 1). The proportion of SoC images was highest in Pathoma (21.4%) and the AAD curriculum (19.4%) and lowest in Boards and Beyond (4.8%). Diseases with the highest proportion of SoC images were dyschromia (80.0%) and acne (38.9%). The lowest proportion of SoC images were alopecia (13.3%) and atopic dermatitis/eczema (10.8%), despite these conditions occurring commonly in populations with SoC (Table 2; Alexis et al., 2007; Ebede and Papier, 2006).

The limited representation of SoC in medical education has been a longstanding issue in dermatology education. Our results compound existing research showing the lack of diversity of images used in dermatology training. Although some diseases that are more common in SoC than in non-SoC populations (e.g., dyschromia) are well represented, diseases that commonly affect both SoC and non-SoC patients (e.g., alopecia and eczema) are poorly represented (Ebede and Papier, 2006; Fenton et al., 2020).

At the earliest stage of medical education, students are not trained in recognizing skin manifestations in different skin tones. This may ultimately result in delayed or incorrect diagnosis, improper treatment, and increased morbidity and mortality for patients with SoC (Alvarado and Feng, 2020; Fenton et al., 2020). Study limitations include the cross-sectional study design, small sample size, and subjective nature of photograph categorization.

To address racial disparities in dermatology, dermatologists and medical schools are working to reduce these gaps in education on SoC. Schools have created action committees to review medical school lecture slides for SoC and offer alternative SoC images for students. Resources such as VisualDx are increasingly used in dermatology training and feature a greater representation of SoC compared with other sources (Alvarado and Feng, 2020). Medical

Table 1

Number of images of SoC and non-SoC phototypes in medical resources.

Source	SoC n (%)	Non-SoC n (%)	Indeterminate n (%)	Total N
American Academy of Dermatology Basic Dermatology Curriculum	124 (19.4)	509 (79.8)	5 (0.8)	638
Amboss	18 (7.2)	228 (91.6)	3 (1.2)	249
Boards and Beyond	4 (4.8)	80 (95.2)	0 (0)	84
Firecracker	7 (10.0)	63 (90.0)	0 (0)	70
First Aid 2020	11 (16.2)	56 (82.4)	1 (1.5)	68
Pathoma	3 (21.4)	11 (78.6)	0 (0)	14
Total	167 (14.9)	947 (84.3)	9 (0.8)	1123

SoC, skin of color.

<https://doi.org/10.1016/j.ijwd.2020.12.018>

2352-6475/© 2021 The Author(s). Published by Elsevier Inc. on behalf of Women's Dermatologic Society.

This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Table 2
Representation of common dermatologic diseases in skin of color in medical resources.

Diagnosis	American Academy of Dermatology Basic Dermatology Curriculum	Amboss	Boards and Beyond	Firecracker	First Aid 2020	Pathoma	Total
Acne vulgaris	7/14	0/1*	0/1*	0/1*	0/1*	0/0*	7/18 (38.9%)
Alopecia	4/29	0/1*	0/0*	0/0*	0/0*	0/0*	4/30 (13.3%)
Atopic dermatitis/eczema	3/15	1/14	0/3*	0/3*	0/2*	0/0*	4/37 (10.8%)
Dyschromia	10/11	0/1*	0/1*	1/1	1/1	0/0*	12/15 (80.0%)
Pityriasis rosea	5/11	0/1*	0/2*	0/0*	1/2	0/0*	6/16 (37.5%)
Psoriasis	10/40	0/12*	0/4*	0/6*	0/3*	0/1*	10/66 (15.2%)
Seborrheic dermatitis	5/18	0/5*	0/1*	0/0*	0/1*	1/2	6/27 (22.2%)
Tinea infection	14/46	1/11	0/0*	0/0*	0/0*	0/0*	15/57 (26.3%)

Values reported as number of skin-of-color images/total number of images for each disease.

* Diagnoses with no skin-of-color images.

school training materials must continue to be updated to include a representative view of all patients.

Conflicts of interest

None.

Funding

None.

Study approval

The author(s) confirm that any aspect of the work covered in this manuscript that has involved human patients has been conducted with the ethical approval of all relevant bodies.

References

Adelekun A, Onyekaba G, Lipoff JB. Skin color in dermatology textbooks: An updated evaluation and analysis. *J Am Acad Dermatol* 2021;84(1):194–6.
 Alexis AF, Sergay AB, Taylor SC. Common dermatologic disorders in skin of color: A comparative practice survey. *Cutis* 2007;80(5):387–94.
 Alvarado SM, Feng H. Representation of dark skin images of common dermatologic conditions in educational resources: A cross-sectional analysis. *J Am Acad Dermatol* 2020. S0190-9622(20)31138–5.

Ebete T, Papier A. Disparities in dermatology educational resources. *J Am Acad Dermatol* 2006;55(4):687–90.
 Fenton A, Elliott E, Shahbandi A, Ezenwa E, Morris C, McLawhorn J, et al. Medical students' ability to diagnose common dermatologic conditions in skin of color. *J Am Acad Dermatol* 2020;83(3):957–8.

Katherine L. Perlman MPH ^{a,*}
 Natalie M. Williams BS ^b
 Ista A. Egbeto BS ^c
 David X. Gao BA ^a
 Naomi Siddiquee BS, BA ^d
 Joyce H. Park MD ^e

^a University of Illinois College of Medicine, Peoria, IL, United States
^b University of Miami Miller School of Medicine, Miami, FL, United States
^c Tufts University School of Medicine, Boston, MA, United States
^d Medical College of Georgia, Augusta, GA, United States
^e Palo Alto Medical Foundation, Mountain View, CA, United States

* Corresponding author.

E-mail address: kperlma2@uic.edu (K.L. Perlman)

Received 20 September 2020

Received in revised form 22 December 2020

Accepted 31 December 2020