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An Analysis of the Diversity of Skin Colour Representation in Paediatric Nursing Practitioner Textbooks

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ABSTRACT

Aims: Our study aims to analyse 8 commonly used textbooks to determine how diverse skin tones are represented in paediatric nursing practitioner education.

Design: Literature reviewed from 2016 to 2024 demonstrated that the lack of darkly pigmented skin colour representation in health science education leads to diminished patient outcomes for these populations. Our study sought to study representation teaching images and eight commonly referenced nursing textbooks were chosen for this study, given their use in paediatric nurse practitioner education. Of the eight textbooks selected, five were analysed based on inclusion criteria.

Methods: Two investigators trained in skin prototyping coded each textbook for skin colour representation and coded during 2023–2024. Coders used the widely accepted prototyping scale, the Fitzpatrick Scale (range I-VI, with I being the lightest colour skin and VI the darkest). *Teaching photographs* were defined as all photos used to provide insight into a disease or diagnostic technique that included human skin. Two individual coders coded and documented data, ensuring each coder was blinded to the overall results.

Results: Our analysis of 5 textbooks revealed that 2112 images met the criteria as teaching images. Of the 2112 teaching images, 593.5 included images of type IV-VI skin (darkly pigmented skin), resulting in a 28% representation of dark skin tone images. Additionally, 2 of the 82 total illustrations included patients with dark skin tones, indicating a representation of 2.5%. However, chapters addressing conditions of child abuse/neglect (55.95%) and stigmatised social issues (infectious disease, 54.88%) displayed a disproportionate representation of patients from these demographics.

Conclusions: Our results highlight the importance of enhancing equitable representation in educational resources for nursing practitioners.

Implications for the Profession/ Patient Care: There is room to collaborate with other health science institutions to establish clear guidelines for future improvement in expanding teaching images to include diversity representation in education.

Patient or Public Contribution: No patient or public contribution.

Summary

- Increase representation within the field of nursing.
- Improve patient outcomes from better and quicker diagnosis to overall care.
- Need for more accurate teaching materials.
- Improve educational teaching materials to better patient care.

Paediatric Nurse Practitioners (PNP) in the United States of America are advanced practice registered nurses trained in the care of children, birth through adolescence, with a focus on home promotion, disease prevention, diagnosis and disease management (National Association of Pediatric Nurse Practitioners 2020). The paediatric-focused nursing practitioner curriculum compromises education in treating acute and chronic conditions, health promotion as well as disease prevention. The diagnoses and treatment of common dermatologic conditions, such as acne and eczema, are part of the curriculum, as well as other disorders with cutaneous manifestations.

1 | Background

Nursing education, along with other health science education, needs to include images that represent the diversity of the patients they serve as well as the diversity of the students themselves to foster an inclusive environment, based on literature from 2016 to 2024 reviewed. Inadequate or inappropriate representation of dark skin tones in health education has been referred to as "visual racism" (Kamath et al. 2021). Racial and ethnic bias is perpetuated when students do not learn to recognise common manifestations in darkly-pigmented skin, leading to delayed diagnosis and poor prognosis. The National Academies of Sciences and Engineering has highlighted how important nursing is in supporting health equity (National Academies of Sciences, Engineering and Medicine 2021). Addressing visual racism in dermatological images addresses bias and the inequities it creates. Lack of training regarding cutaneous manifestations of people with darkly pigmented skin and mucous membrane colour may also lead to improper care or misdiagnosis. Work has been done in nursing and other health science education to increase the variation in skin colour representation, but it is not yet universal (Oozageer Gunowa et al. 2020; Le et al. 2023; Pierce and Felver 2021).

Skin of colour is a term often used in clinical settings and in the literature to refer to dark skin pigmentation, often defined as levels IV-VI on the Fitzpatrick scale (Le et al. 2023) (Adawi et al. 2023). We want to acknowledge that skin pigmentation does not correlate to race and that race is a social construct (Braveman and Parker Dominguez 2021). While the Fitzpatrick scale poses limitations, it is a commonly used clinical tool in the United States and has been used in other health science education research.

The lack of representation of diverse skin tones has been a significant issue in medical education and is noted to be associated with overall worse outcomes for these patients (Perlman, Klein, and Park 2020). Previous studies have shown a lack of dark skin tone representation within dermatology textbooks, with the most common Fitzpatrick skin types represented as type II (light) and III (medium), and a significant disparity between the United States distribution of skin types and skin type representation (Reilley-Luther et al. 2020). Conversely, there seems to be an over-representation of darkly pigmented skin types in stigmatised conditions, such as sexually transmitted diseases, such as syphilis (Adelekun, Onyekaba, and Lipoff 2021). There is little research so far in skin colour diversity representation in nurse practitioner (NP) education or paediatric health education.

Studies have examined these discrepancies in teaching material specific for medical school education, addressing the visual racism in teaching photographs (Le, 2023) and improving the number of dark skin tone representations within Canadian pre-clerkship courses (Yousuf and Yu 2021). These studies both found that the lack of skin colour representation can negatively impact patient care and contribute to the disparities these minorities already face. For example, delays in diagnosis and misdiagnosis due to a lack of training in diagnosing conditions in dark skin lead to more advanced disease states associated with poorer prognoses and outcomes for patients.

In the discipline of nursing, a study examining 15 nursing textbooks used in pre-licensure education, found that the common nursing textbooks over-represent lighter skin tones and under-represent diverse skin tones (Pusey-Reid et al. 2023). Of the over 14,000 photo images and drawn graphics depicting skin tone, approximately 68% of the skin tones represented were light compared to 15% medium and 9.4% dark (Pusey-Reid et al. 2023). In a survey of nurse educators in the United Kingdom, most understand the need to represent all skin types but reported needing access to quality images of darkly pigmented skin (Clemett et al. 2024). This under-representation of skin colour in educational materials can have drastic effects on patient outcomes. A multiple-method collective case study performed in 2020 examined the teaching and learning activities of Higher Education Institutes in England during 2017 and 2018 (Oozageer Gunowa et al. 2020). Their analysis confirmed that these institutions overwhelmingly directed their instructional tasks towards people with Caucasian skin tones. In contrast, their educational material directed at dark skin tones was found to be superficial and brief (Oozageer Gunowa et al. 2020). Another study led by Oozageer Gunowa found that nursing education fails to address skin tone variation in dermatological conditions and this lack of skin tone diversity presses a need for more inclusive educational materials (Oozageer Gunowa et al. 2021).

While previous studies have demonstrated a lack of skin tone diversity within nursing education (Oozageer Gunowa et al. 2021), we sought to investigate specific paediatric nurse practitioner textbooks, that are commonly used within paediatric nurse practitioner education to see how they represent certain skin conditions and if these textbooks are accurately representing all skin tones. While our analysis was performed in the U.S., it is internationally relevant due to the U.S.'s diverse demographics as well as other countries, like the UK, demonstrating inequities

in skin colour representation in medical education (Clemett et al. 2024).

2 | Objectives

In this study, we examined eight textbooks frequently used in paediatric nurse practitioner (PNP) education to analyse the representation of Fitzpatrick skin types in teaching images, illustrations and videos. Our study sought to answer the question: What is the representation of Fitzpatrick skin types within Paediatric Nursing Practitioner textbooks and understand trends in the high representation of darker skin tones in stigmatised conditions?

3 | Study Design

The study design was quantitative and observational, following the Strobe (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for our analysis. Teaching images, in the form of illustrations and video tutorials, in textbooks commonly used in PNP education were analysed to represent skin colour in all content, not just dermatology.

3.1 | Data Sources and Measurements Tool

Eight popular foundational textbooks commonly used and referenced by PNPs were selected and analysed for this study and coded from 2023 to 2024. Textbooks were a convenience sample chosen based on expertise in the field of PNP education, as well as an informal review of multiple PNP program websites in the United States to review the textbooks their programs used. Not all PNP programs share their textbook choices, as such, it was not an exclusive search, but one of convenience. These textbooks encompass general PNP education with a broad range of diseases and diagnoses and are not specific to cutaneous PNP.

Textbooks were accessed via open access with the author's affiliated institution for Zuckerman Parker Handbook of Developmental and Behavioural Paediatric for Primary Care (149-6397398), Zitelli and Davis' Altas for Paediatric Physical Diagnosis (978-0323777896) Nelson Essentials of Paediatrics (978-0323775625) and The 5-min paediatric consult (978-1496381774). The following four textbooks were accessed via request through an Interlibrary Loan for Burn's Paediatric Primary Care 7th Edition (978-0323581967), Primary Care Paediatrics for the Nurse Practitioner (978-0826140944), Paediatric Primary Care Case Studies (978-0763761363), Paediatric Physical Examination (978-0323476508).

All images identified within these textbooks were coded in accordance with previously established Fitzpatrick's phototyping guidelines used in the United States commonly in clinical care and previous studies (Oozageer Gunowa et al. 2020; Pusey-Reid et al. 2023). Categorical skin colour representation using the Fitzpatrick Scale is a valid and useful tool and is the most widely accepted method of phototyping skin types, especially in studies involving skin cancer, dermatologic conditions and aesthetic medicine (Gupta and Sharma 2019). This scale ranges from I-VI, with I-II representing very light skin tones that easily burn when exposed to UV light, III-IV as medium skin tones and type V-VI, representing persons of dark skin tone (Table 1). In this study, as well as in previous studies, Fitzpatrick skin types IV-VI were coded as skin of colour (Le et al. 2023). While the Fitzpatrick scale sometimes oversimplifies the complexity of skin tones, it remains the most widely used scale for phototyping skin in research and clinical settings. The textbooks were coded by two individuals, who had been trained to recognise teaching photographs and to utilise the Fitzpatrick scale when any dermatologic teaching image appeared. Findings for each textbook were documented in two separate electronic files so that the coders remained blind to ensure the textbooks were fairly assessed.

3.2 | Quantitative Variables

Variables collected focused on the number of teaching images. Teaching mages were colour photographs, illustrations, or videos and were defined as those that included photos of human skin (including scalp), provided to instruct a student about a disease, diagnostic technique, or concept. Cutaneous images taken from different angles were counted as different images; images were counted as duplicates if they were the same or a zoomed-in/out version of the same image. The image did not need to be related to a dermatology condition or show a cutaneous symptom or finding; rather, all images related to any form of the disease, physical exam finding, diagnostic technique, or concept were included. For example, a skin image showing an issue with joints or growth is considered a teaching image. A photograph used to "represent" a patient described in a case is also counted as a teaching image. As an example, a vignette describing a patient struggling with depression with an accompanying image of a respective patient

TABLE 1 | Fitzpatrick skin phototype scale (Gupta and Sharma 2019).

Fitzpatrick skin phototype	Skin reaction to UV exposure	Appearance
I	Always burns, never tans	Light, pale white
II	Usually burns, tans less than average (with difficulty)	White, fair
III	Sometimes mild burn, tans about average	Medium white to olive
IV	Rarely burn, tans more than average (with ease)	Olive tone, light brown
V	Very rarely burns, tans very easily	Brown, dark brown
VI	Never burns, tans very easily, deeply pigmented	Dark brown, brown to black

TABLE 2 | Textbook teaching images.

Textbook	Total images	Total skin of colour images	Percent skin of colour	Coder variability
Paediatric Physical Examination	223	49.5	22.20%	1.13%
Nelson's Essentials of Paediatrics	39	14	35.90%	14.29%
Burn's Paediatric Primary Care	89	16.5	18.50%	13.72%
Zitelli and Davis's Atlas of Paediatric Physical Diagnosis	1761	513.5	29.20%	3.59%

counts as a teaching image. An example of an image that would not fit the criteria for being a teaching image includes an image on the title page of a textbook chapter for a broad category of diseases, but the image itself does not depict or intend to depict a particular disease. The criteria for selecting a teaching image were the same as those used in the study by Le et al. (2023).

If multiple patients were included in one image, then each patient was coded according to their Fitzpatrick skin type but was recorded as only one teaching image. The Fitzpatrick Scale, originally developed for dermatology, is widely used in clinical practice and research for categorising skin types. Persons not the patient but present in the teaching images (the person performing the exam or procedure) were excluded from this study. Diagrams, black and white images, non-teaching photographs (like those associated with a non-specific disease chapter heading) and those showing unclear skin depictions (mucosa, internal anatomy, etc.) were excluded. The same image was not recounted if it had been used several times, including if it was re-sized or cropped.

3.3 | Statistical Methods

Our analysis compared variables such as the total number of images and the number of skin colour photographs identified between various textbooks, illustrations and videos. This comparison was based on the averages derived from two independent coders. Averages of the total number of images counted were rounded to the nearest whole number. To assess intercoder reliability, we calculated the percent difference between the proportions of skin colour (Fitzpatrick skin types IV–VI) images classified by each coder. This process entailed determining the absolute difference between the two coders' proportions and subsequently normalising this difference by dividing it by the average of the two proportions. If intercoder reliability exceeded a 15% difference for any textbook, the textbook was recoded until it met a reliability less than 15%.

4 | Main Results

Based on the analysis of five textbooks, 2112 images met the criteria as teaching images. Of the 2112 total teaching images, 593.5 of the images included images of type IV–VI skin, as shown in Table 2 and Figure 1. This indicates that the textbooks had a 28% representation of skin colour images depicted in Figure 2 and Table 3. Additionally, of a total of 82 illustrations, 2 of the illustrations included type IV to VI skin, indicating a skin of colour representation of 2.5% in the illustrations, as depicted in
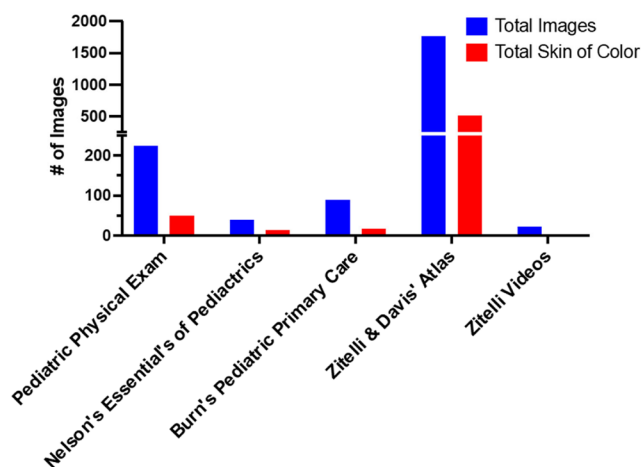

FIGURE 1 | Number of total images versus number of images including skin of colour representation.

Figure 3. Furthermore, as shown in Table 4, one of the textbooks included videos that were also analysed and of the 22 videos analysed, 2 of the videos included type IV to VI skin, which equates to 9% skin colour representation in teaching videos. Three of the textbooks in our original inclusion did not have any images, thus failing to meet the study criteria for having teaching images and were not analysed in our study. The three textbooks not meeting criteria were Zuckerman Parker Handbook of Developmental and Behavioural Paediatric for Primary Care (149-–6397398), The 5-min Paediatric Consult (978-–1496381774) and Paediatric Primary Care Case Studies (978-0763761363) because they did not have any teaching images.

4.1 | Other Analyses: Individual Textbooks

In the Paediatric Physical Exam Textbook, there was a total number of images of 223 and total skin colour images of 49.5 indicating a 22.2% of skin colour representation in this textbook. Additionally, this textbook had 60 teaching illustrations and 0 total illustrations in skin colour. There was 1.13% variability between the coders who analysed this textbook.

The Nelson Essentials of Paediatrics textbook had 39 total images and 14 of those images included skin of colour, with a 35.9% of skin colour representation. There were 12 total illustrations and 2 total images of skin colour, indicating 16.6% for the illustrations in this textbook. There was 0% variability between the coders who analysed this textbook.

TABLE 3 | Textbook teaching illustrations.

Textbook	Total illustrations	Total skin of colour illustrations	Percent skin of colour	Coder cariability
Paediatric Physical Examination	60	0	0%	0%
Nelson's Essentials of Paediatrics	12	2	16.60%	0%

TABLE 4 | Teaching videos.

Textbook	Total videos	Total skin of colour videos	Percent skin of colour	Coder variability
Zitelli and Davis's Atlas of Paediatric Physical Diagnosis	22	2	9.09%	0%

FIGURE 2 | Percentage of skin of colour representation across textbooks.

FIGURE 3 | Number of total illustrations versus number of illustrations including skin of colour representation.
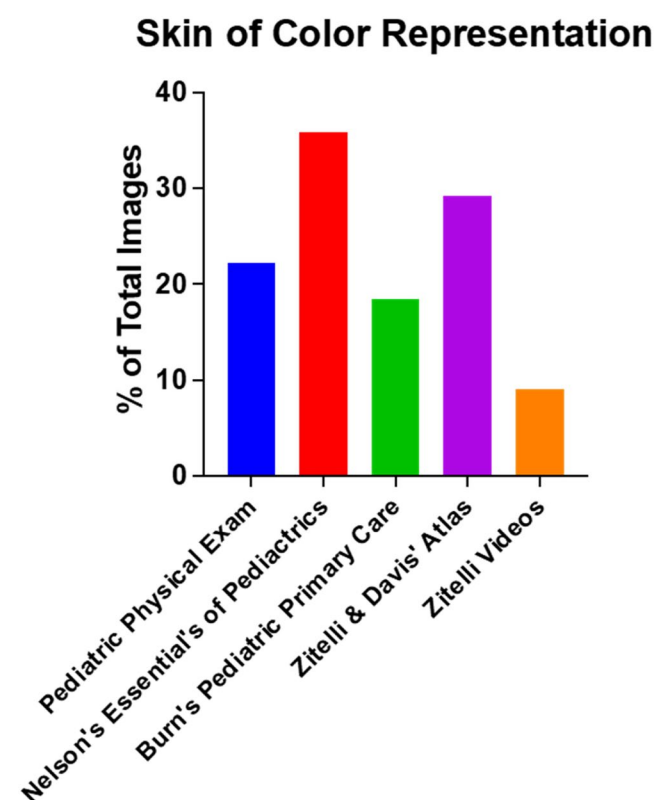
The Burn's Paediatric had a total of 89 images and 16.5 total images of skin of colour, with 18.5% of skin of colour representation. There was 13.72% variability between the coders who analysed this textbook.

The Zitelli and Davis's Atlas of Paediatric Physical Diagnosis had 1761 total teaching images and 513.5 total skin of colour representation, indicating 29.2% of skin colour representation. There were 22 teaching videos associated with this textbook accessible via expertconsult.com as well and of those 2 had skin colour for
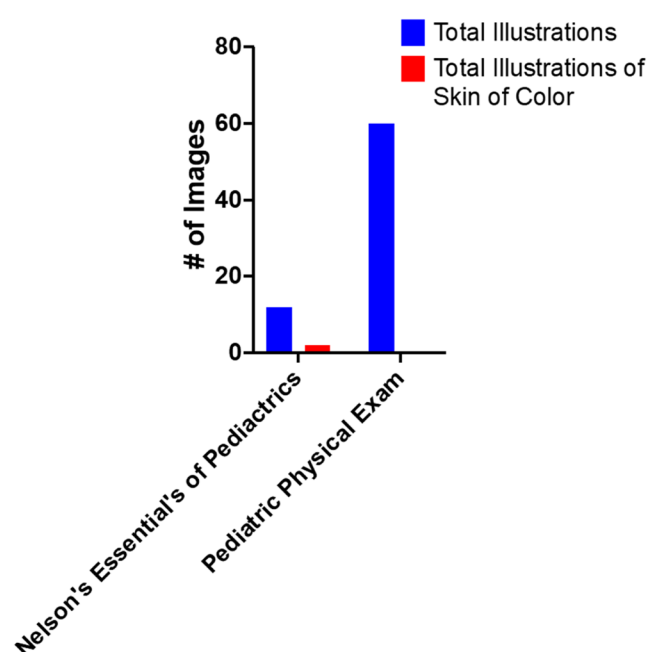
a 9.09% representation of skin colour in the videos. There was a 3.59% variability between the coders who analysed the images and 0% variability for those who analysed the images in this textbook.

4.2 | Other Analyses: Chapter Comparisons

When examining specific chapters, a disproportionate distribution of skin colour representation was noted, with certain chapters having a higher percentage of skin colour while others had lower percentages compared to the 28% average skin colour representation for all of the textbooks analysed. The chapters that had skin colour representation with a difference of approximately 10% relative to the mean of all the textbooks

of 28% are outlined in Table 5. Additionally, chapters with fewer than 6 teaching images included in the primary analysis, were excluded from the above table due to a small sample size potentially skewing individual chapter results.

Of the teaching images selected for analysis, chapters covering traditionally stigmatised medical conditions had the highest percentages of skin colour, including chapters titled infectious disease (37.97%), nutrition (37.35%), paediatric/adult gynaecology (54.88%), oral diseases (47.59%) and child abuse (55.95%) in Zitelli and Davis's Atlas of Paediatric Physical Diagnosis. Furthermore, 53.3% of the teaching images in chapter 20, neurologic assessment, in the Paediatric Physical Examination textbook were skin of colour. The chapter with the highest rate of skin colour was seen in Zietlli and Davis's chapter on child abuse, with 55.95% of the images being of skin colour.

The chapters with below 10% of the average skin colour representation included Skin (15.32%) and Male and Female Breast (14.3%) within the Paediatric Physical Examination textbook. Zitelli and Davis's Atlas of Paediatric Physical Diagnosis showed a similar trend when reviewing chapters related to Genetic Diseases (11.16%), Neonatal (11.41%), Vascular Anomalies (12.46%) and Urology (17.7%). In the Paediatric Physical Examination textbook chapters that had at least 6 teaching images or more and that had no skin colour representation included Newborn Assessment, Chest and Respiratory System, Male Genitalia and Female Genitalia.

5 | Discussion

5.1 | Generalisability

The aim of this study was to examine skin colour representation within paediatric nurse practitioner textbooks and videos associated with the textbooks. Analysis included eight commonly used paediatric nurse practitioner textbooks and analysed teaching images, illustrations and videos in them. This is the first study to analyse teaching videos in nursing textbooks and the first to analyse teaching images in paediatric nurse practitioner textbooks.

Comparisons between specific chapters in relation to percentage variation within skin colour representation were shown to have comparable results with previous studies, with over-representation of skin colour in stigmatised diseases, as shown in Zitelli and Davis's Atlas of Paediatric Physical Diagnosis chapter on infectious disease. Comparable findings were found within the topics of child abuse and neglect of this same educational resource. Specifically, this chapter had the highest skin colour representation of all the chapters analysed within this text, with 55.95% of teaching images being on skin colour. While the over-representation of certain demographics in specific conditions may emphasise clinical importance, it may also perpetuate implicit bias, which has been shown to be associated with disparities in treatment recommendations, expectations of therapeutic bonds, patient-provider communication, pain management and empathy (Maina et al. 2018). As a result, it is imperative to have representation of patients of darkly pigmented skin in order to maintain patient safety and limit bias in patient care management.

In light of this, there has been a substantial increase in literature surrounding delayed diagnosis and poor patient outcomes for individuals of skin colour (Perlman, Klein, and Park 2020; Dawes et al. 2016; Poladian, De Souza, and McMichael 2019; Oozageer Gunowa et al. 2020), however few studies have analysed why specific medical topics/conditions have a larger proportion of skin colour representation. One theory may be tied to unconscious racial biases in healthcare that lead to improper patient management based on perceived social norms, as was shown by a study at Albany Medical Center when the introduction of universal abuse screening shifted the demographic profile of children identified from an over-representation of minority and impoverished children to an increasing number of white children (Chan et al. 2024). This idea has caught more traction since the beginning of the Black Lives Matter movement, as well as the racial discrepancies seen in the mortality rate associated with

TABLE 5 | Chapter specific percentage of skin of colour representation.

Textbook	Chapter title	Skin of colour (%)
Zitelli and Davis	Child Abuse	55.95
Zitelli and Davis	Paediatric & Adult Gynaecology	54.88
Paediatric Physical	Neurologic Assessment	53.30
Zitelli and Davis	Oral Diseases	47.59
Zitelli and Davis	Infectious Disease	37.97
Zitelli and Davis	Nutrition	37.35
Zitelli and Davis	Urology	17.71
Paediatric Physical	Male and Female Breast	14.30
Zitelli and Davis	Vascular Anomaly	12.46
Zitelli and Davis	Neonatal	11.41
Zitelli and Davis	Genetic Diseases	11.16
Paediatric Physical	Skin	5.32

COVID-19 (Dodd et al. 2023). This concept supports the claim that increasing awareness of racial disparities in healthcare delivery will better prepare the next generation of medical professionals to serve individuals of skin colour. Further research is needed to better understand why some conditions and teaching topics tend to have under- or over-representation of darkly pigmented skin and if there is a correlation between current curriculum standards used by higher education institutions.

The lack of clinical presentation and representation within these learning materials presents several problems. First, representation in educational materials is crucial for creating an inclusive learning environment. It allows for students to see themselves reflected in their studies and thus promote a sense of belonging. Second, accurate representation is essential for clinicians and clinicians-in-training to be able to recognise different skin pathologies to promote diagnostic accuracy. Furthermore, it is imperative to address the lack of diverse teaching images in PNP education, as failing to adequately represent diverse skin tones contributes to worse health outcomes and disparities. Equitable representation of brown and black skin is necessary to prevent delayed diagnosis, reduced quality of life and negative outcomes for patients with brown and black skin (Dawes et al. 2016; Poladian, De Souza, and McMichael 2019). This analysis demonstrated an under-representation of diverse skin tones across all textbooks and topics, except when one of the textbooks discussed abuse. This data reveals that the chapter discussing child abuse had a 56% representation of diverse skin tones, the only chapter of the 8 textbooks examined included the majority of teaching images with diverse skin tones.

In efforts to improve representation within medical and learning education, "Mind the Gap Clinical Handbook" for dark skin tones was created for students. This handbook highlights signs and symptoms of skin conditions in brown and black skin tones so that learners can recognise the disease in all types of skin tones in their early steps of education and be able to accurately diagnosis these conditions. This is a freely available resource for any student pursuing health education. (Black and Brown Skin 2020).

5.2 | Limitations

This study analysed only eight paediatric nurse practitioner textbooks and did not assess older versions of the textbooks. While we analysed eight commonly used textbooks, we acknowledge that other textbooks were not included in this study that maybe used in PNP education. This study solely focused on a convenience sample of textbooks used in paediatric nurse practitioner education in the United States.

Although the Fitzpatrick scale is widely used for skin colour typing, it holds several limitations that need to be addressed. First, given that the scale was initially developed to classify white skin in response to UV exposure, it lacks the ability to capture the range of skin tone in people of colour. Second, given its subjective and static nature, it does not account for the changes in skin that may occur due to tanning, burning, disease, etc. (Gupta and Sharma 2019). In addition, this scale oversimplifies the skin tones across different ethnic cultures, failing to provide the significance of an individual's skin tone. Lastly, this scale fails to account for the changes in skin tone seen in different areas of the body (face vs. trunk vs. extremities vs. inguinal region, etc.). These limitations suggest a need for a more nuanced skin-typing tool that may be utilised to reflect the diversity and complexity of human skin. Currently, there are ongoing discussions on expanding the Fitzpatrick scale to further subdivide the IV, V and VI categories, but a widespread, accepted consensus about this expansion has yet to be reached (Coleman, Mariwalla, and Grimes 2023).

Furthermore, in the coding process, there may have been individual human error in categorising a teaching image into its respective Fitzpatrick scale and we attempted to rectify this by analysing the percent differences between coders. Additionally, within coding based on the Fitzpatrick scale, types that adjacent to each other on the scale, such as types III and IV for example, can look similar, especially in electronic images and may contribute to coder variability. However, differences between types adjacent on the Fitzpatrick scale may not hold clinical relevance in differences, but there is a wider distinction between types II and V, thereby entailing clinical relevance in the distinction between types II and V.

6 | Conclusion

The findings of this study suggest that the current resources available for nurse practitioner education may hinder the development of inclusive learning environments for clinicians in training, while introducing bias to patients of darkly pigmented skin. To address these issues, it is imperative for publishers of these textbooks to take the steps necessary to increase the representation within these resources. These may include the addition of annual revision schedules, partnering with local health institutions and/or re-establishing the representation guidelines for new editions and volumes. This change could not only reduce stereotyping in patient care settings but also improve diagnostic timelines for these at-risk populations. To foster a healthcare system capable of effectively serving patients from all racial and ethnic backgrounds, educators must be encouraged to assess the nature of skin colour representation in their current teaching materials. Further research is needed to explore the impacts of these changes on clinical outcomes and to develop comprehensive guidelines for incorporating diversity in educational resources. It is with these changes that we can cultivate an environment free of bias that promotes health and safety for all.

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