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Perspective

A perspective on inequities in the management of radiation dermatitis

Radiation dermatitis (RD) is a common adverse skin reaction experienced by approximately 95% of cancer patients who undergo radiation therapy (RT) either during or after treatment.[1] The proposed pathophysiology is complex and related to disruptions in the skin's basal layer and ability to regenerate epidermal cells.[1] Its acute presentation can range from mild erythema, hair loss, and dry peeling to moist desquamation and severe ulceration. Secondary infections and healing by fibrosis are potential sequelae.[1] The maximum therapeutic benefit of RT may be limited by the occurrence of RD and may lead to early termination or discontinuation of cancer treatment.[1] Despite advanced radiotherapeutic treatment planning, skin dose limiting techniques, and preventative treatments, RD is still very common. Additionally, there exists significant disparities in the clinical management of RD and its surrounding research. Critical areas that warrant further attention include considerations for people with darker skin tones, the influence of living in warmer climates, and the impact of care delivery and research in low-resource settings. This perspective piece explores and discusses these disparities further and highlights their implications.

There are limited published studies that explore the efficacy and tolerability of RD interventions across individuals with darker skin tones and those living in warmer climates. Current validated clinician-reported RD severity scales do not capture the differences in RD presentation in darker skin tones. Hyperpigmentation is not a component of the US National Cancer Institute - Common Terminology Criteria for Adverse Events (NCI CTCAE) or Radiation Therapy Oncology Group (RTOG) and European Organization for Research and Treatment of Cancer (EORTC) radiation morbidity criteria for RD, despite clear evidence that erythema in darker skin tones is difficult to detect and often presents as increased darkening of the skin. As a result, RD may be underdiagnosed in people of color when using existing clinician-rating scales.[2] Despite evidence on the differential presentation of RD in people of color, studies often exclude skin tone as an influential factor. Instead, meta-analyses tend to show data based on the country of origin (e.g., Asia, North America, or the UK) but do not provide a breakdown by skin tone of individuals. Although research and data on the effect of warmer climates on RD is lacking, there do exist studies in atopic dermatitis (AD), a chronic inflammatory skin disease, that show warmer temperatures alter skin barrier and therapeutic response. It is reasonable to speculate that a similar difference in skin barrier and efficacy of treatment for RD in individuals living in warmer climates may influence the severity grade of RD. In order to advance strategies to prevent, standardize the reporting, and manage RD, we need to understand the effects of skin tone and environmental climates on the presentation, detection, and treatment of RD.

Behroozian et al., one of the largest systematic reviews conducted on acute RD, included 235 original studies from 1946 to 2023 to investigate the quality of evidence on the prevention and treatment of RD. This review highlighted the lack of data on RD in low-resource settings and less developed areas of the world.[1] The majority of randomized controlled trials (RCTs) are conducted in high-income, western countries (primarily the USA, UK, and Canada), due to more robust funding, scientific infrastructure, information access, and increased access to essential research partnerships.[3] Lower-income countries have limited resources and infrastructure to set up, fund, conduct, and support the necessary processes for large-scale clinical trials.[3] Low-and middle-income countries (LMICs) bear a significant burden of cancer with poorer health outcomes when compared to high-income countries.[4] This is further worsened by the chronic shortage of RT machines and radiation personnel. These limitations also impact the ability to conduct large-scale studies and the availability of effective interventions for RD, which often leads to early termination of RT.[1]

It is crucial to recognize that RT is an essential treatment modality of cancer and this need does not only exist in high-income countries and Caucasian populations. Though numerous RCTs for RD exist, many enroll primarily Caucasian participants. A recent systematic review on barrier films for RD in breast cancer noted $>$ 90% Caucasians across five RCTs which could have skewed results for the true effectiveness of the interventions.[5] Additionally, whilst breast cancer incidence is relatively higher in high-income western countries with larger Caucasian populations, there is a disproportionate share of breast cancer deaths in LMICs.[6] The highest mortality rates are in the Pacific Islands (Fiji), the Caribbean (The Bahamas), Sub-Saharan Africa (Nigeria) and Southern Asia (Pakistan), which have predominantly non-Caucasian individuals.[6] There is a critical need for the inclusion of patient populations from lower-income countries in RCTs for RD and improved equitable access to effective oncology treatments and supportive oncology care. Furthermore, a better understanding of the treatment of RD in LMICs and across all skin tones is imperative to improve disparities in treatment-related adverse outcomes and potentially improve mortality rates.

RD management in LMICs and resource-limited environments may often be restricted to inexpensive options. Washing with mild soap or application of topical steroids are less costly modalities and utilize less resources.[1] Although Behroozian et al. recommended both Mepitel film and photobiomodulation therapy (PBM) for the prevention of RD, neither of these modalities are widely used, especially in LMICs. One of the main reasons for the lack of implementation into routine care is cost. Each of these interventions may cost nearly or even more than $100 per course of RT, resulting in higher out-of-pocket costs for patients. Considering the GNI per capita of LMICs, the aforementioned costs would restrict access to these effective treatments.[4] Data also suggests that current RD management approaches may be insufficient to cater to all of patients' needs, especially in

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terms of functional impairment related to the side effect.[7] In addition, it is necessary to develop practical and feasible approaches to evaluate the effectiveness of treatments in the context of low-resource settings.

We highlight a palpable gap in literature regarding RT skin toxicity resources, a critical need for the inclusion of patients with all skin tones and representation of countries with warmer climates in clinical trials for RD, as well as the feasibility and applicability of the interventions in LMIC settings. Current evidence for RD treatment focuses primarily on fair-skinned patients, predominantly in high-income countries with access to expensive interventions. By addressing these disparities, we can promote inclusivity and global applicability in the RD field to ensure that all patients undergoing RT, regardless of skin tone and geographical location, have access to evidence-based treatments and receive the best care possible.

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Declaration of competing interest

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Declaration of generative AI and AI-assisted technologies in the writing process

The authors did not use any tools/services of generative AI for writing of this manuscript.

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