

REVIEW

Dermatology: how to manage rosacea in skin of colour

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Abstract

Rosacea is a common inflammatory skin disorder affecting the face. Common cutaneous symptoms include papules, pustules, persistent centrofacial erythema, telangiectasias, recurrent flushing, phymatous changes and a variety of ocular manifestations. Previous epidemiological studies have demonstrated that the incidence of rosacea is much lower in people with darker Fitzpatrick phototypes compared to fair-skinned individuals. In patients with darker skin, the centrofacial erythema can be masked and difficult to appreciate, impacting the ability for providers to make diagnoses and leading to misdiagnoses. Thus, it is difficult to say with certainty

that the disparities in prevalence in rosacea amongst fair-skinned and darker individuals are true. The primary aim of this article is to raise awareness that rosacea is a global disease and to provide healthcare professionals with strategies to identify and manage rosacea amongst individuals with skin of colour.

Keywords: dermatology, Fitzpatrick, rosacea, skin of colour.

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Introduction

Rosacea is a common, chronic, inflammatory skin disorder that primarily affects the cheeks, chin, nose and forehead.¹ Patients can present with cutaneous symptoms, including persistent centrofacial erythema, papules, pustules, telangiectasias, recurrent flushing and phymatous changes. In addition, some patients may have ocular manifestations such as conjunctival injection, ocular irritation and tearing. In 2002, the National Rosacea Society Expert Committee developed a classification system for rosacea that describes four clinical subtypes: erythematotelangiectatic, papulopustular, phymatous and ocular.² However, in 2017, the global ROSacea COnsensus (ROSCO) recommended a transition from a subtype approach to a phenotype approach to diagnosis, classification and management.³ This allows for more individualized patient management according to the patient's presenting disease features instead of categorization by predefined subtypes.⁴

Epidemiological studies suggest that the prevalence of rosacea is much lower in people with darker Fitzpatrick phototypes (phototypes IV–VI) compared to fair-skinned individuals (Fitzpatrick skin phenotypes I or II).⁵ However, it is unclear if this is related to true differences in prevalence or disparities in diagnosis. In patients with skin of colour, the characteristic manifestations of rosacea, particularly centrofacial erythema,

can be masked, impacting the recognition of the diagnosis.⁶ Some estimates report a worldwide prevalence of rosacea in people with skin of colour as high as 40 million cases.⁷ Despite this estimate, reports continue to position rosacea as a disease of fair-skinned individuals, leading to the perception that it does not occur in darker phototypes.⁸ As a result, patients with skin of colour with rosacea can experience misdiagnoses⁹ and delayed diagnoses,⁶ negatively impacting quality of life and disease progression. The purpose of this article is to bring attention to rosacea as a global disease and to provide strategies for identifying and managing rosacea amongst individuals with skin of colour.

Methods

For this review, a search of the relevant literature was limited to the studies published in the English language. The search was performed in May 2021 using PubMed, Google Scholar, SCOPUS, MEDLINE and Cochrane Database of Systematic Reviews. Keywords in our search included "rosacea" AND "Fitzpatrick", "skin of colour", AND "treatment", "intervention", "management", "diagnosis", "epidemiology" or "outcomes". The search strategy included randomized controlled trials, observational studies, systematic reviews, meta-analyses, literature reviews and cross-references of the relevant articles.

Review

Epidemiology

Although the exact incidence and prevalence of rosacea remains unknown, one recent meta-analysis published in 2018 reports that the worldwide prevalence of rosacea is 5.46%.¹⁰ It is a disease commonly affecting adults aged between 30 and 50 years and is more prevalent amongst women than men.¹¹ Rosacea can be seen in any phototype but is more commonly seen in fair-skinned individuals of Celtic and North European heritage (Fitzpatrick skin phototypes I and II). There are limited data on the prevalence of rosacea in populations with darker skin tones, and it is a largely underrecognized disorder. Racial and ethnic data from the US National Ambulatory Medical Care Survey (1993–2010) of 31.5 million rosacea visits demonstrated that 2.0% of patients with rosacea were Black, 2.3% were Asian or Pacific Islander and 3.9% were Hispanic or Latinx.⁹ One cross-sectional, multicentre study conducted in six dermatology clinics across Colombia indicated that of 291 patients with rosacea, 12.4% of them had Fitzpatrick skin phototypes IV or V.¹² Moreover, a study of 2743 Angolan adult patients with Fitzpatrick skin phototypes IV or V reported that only 0.4% of patients had a diagnosis of rosacea.¹³ A study that looked at 168 Korean patients with rosacea revealed that approximately 40% of these individuals had Fitzpatrick skin phototype IV or V.¹⁴ These epidemiological findings suggest that the prevalence of rosacea in skin of colour is more significant than perceived, warranting further attention to diagnosis and treatment in this population.

Pathophysiology

The exact pathogenesis of rosacea has yet to be determined. It is believed to have a multifactorial aetiology, consisting of genetic factors, alterations within the innate immune system, microbial exposure, ultraviolet radiation exposure and vascular hyperreactivity.

Genetics of rosacea, innate immunity dysfunction and microbial exposure

A recent cohort study of identical and fraternal twins was the first to identify that approximately half of the genetic susceptibility of rosacea can be contributed to genetic factors.¹⁵ Whilst family history is relevant to rosacea, no gene mutations specific to patients with skin of colour have been identified. The normal signalling pathway seems to be disrupted in patients with rosacea, whereby individuals have a greater release of proinflammatory proteins that regulate and promote leukocyte chemotaxis, angiogenesis and induction of proinflammatory activity.¹⁶ Various microorganisms found in or on the skin, such as *Demodex folliculorum* and *Helicobacter pylori*, have been implicated as an inciting factor for the inflammatory cutaneous reaction seen in rosacea. However, their exact role is unclear.^{17–19}

Ultraviolet radiation

The role of ultraviolet (UV) radiation in rosacea has been extensively researched and thought to play a role in all phototypes.²⁰ Both UV radiation and visible light can contribute to skin damage, hyperpigmentation and postinflammatory hyperpigmentation commonly seen in individuals with darker skin tones (Fitzpatrick skin phototype IV–VI).²⁰ It is believed that UVB radiation can induce vascular endothelial growth factor 2 and fibroblast growth factor 2 from keratinocytes, which may contribute to the hypervascularity seen in rosacea.^{21,22} UV radiation can also stimulate the production of reactive oxygen species and activate cellular signalling in keratinocytes.²³

Vascular hyperreactivity

Vascular hyperreactivity (vasodilation), which is referred to as prolonged vasodilation due to physiological and non-physiological stimuli, is thought to be implicated in the pathogenesis of rosacea in all phototypes.²⁴ It is still unclear how vasodilation promotes rosacea. A possible cause for these unphysiologically prolonged symptoms of vasodilation is neurovascular dysregulation of thermal mechanisms.²⁵ One theory states that the activation of transient receptor potential vanilloid 1–4 and transient receptor potential ankyrin 1 (receptors that are found on primary sensory neuron endings and keratinocytes) by different rosacea-specific triggering factors can result in cellular responses that lead to dysesthesia, flushing and erythema.²⁶

There have been multiple studies that examined microvascular endothelial function and skin blood-flow response to reactive hyperaemia after skin occlusion and local heating.^{27–29} In these studies, white participants were compared to Southeast Asian, Korean and Afro-Caribbean participants. When the researchers applied local heat and vascular occlusion to skin, they identified that blood flow response to occlusion and circulatory response to heat was significantly less amongst the Southeast Asian, Korean and Afro-Caribbean participants when compared to white participants. The researchers concluded that the differences may be due to genetic variations in endothelial response to these stressors. This is a possible explanation for the decreased propensity for flushing observed in Fitzpatrick skin phototype VI.³⁰

Clinical features

In 2002, the National Rosacea Society Expert Committee helped develop a standard classification and staging system for rosacea.² The committee classified rosacea based on both primary and secondary features, with one or more primary features with or without secondary features being necessary for a diagnosis. However, in 2017, the global ROSCO recommended a transition from a subtype to a phenotype approach to diagnosis, classification and management.³ This allows for more individualized patient management according to the patient's presenting disease

Table 1. Diagnostic, major and minor features of rosacea.

Diagnostic features	
Phymatous changes	<ul style="list-style-type: none"> Chronic inflammation and oedema can progress to thickening of the skin and connective tissue and marked overgrowth of the sebaceous glands. Gradually, this causes a swollen, cobblestoned or lumpy surface of the affected skin. Over time, the skin becomes more nodular with accompanying fibrosis and dilated follicles Sebaceous hyperplasia can cause various bulbous distorted appearing facial features, most commonly affecting the nose (rhinophyma) and other structures, including the central forehead (metaphyma), ears (otophyma), central chin (gnathophyma) and eyelids (blepharophyma) This variant is most predominant in men
Persistent erythema	<ul style="list-style-type: none"> Persistent central facial erythema associated with periodic intensification by potential trigger factors
Major features	
Flushing/blushing and transient centrofacial erythema	<ul style="list-style-type: none"> Redness may involve the peripheral face, ears, neck and upper chest
Telangiectasia	<ul style="list-style-type: none"> Telangiectasias initially develop along the alae nasi and, over time, on the nose and cheek
Inflammatory papules and pustules	<ul style="list-style-type: none"> Patients can develop a centrofacial eruption of small (<3 mm), dome-shaped, acneiform papules and pustules to occasional deep persistent nodules The lesions have a deeper red colour compared to similar lesions seen in acne and have the presence of perilesional erythema In contrast to acne, these lesions are not centred around a comedone
Ocular rosacea	<ul style="list-style-type: none"> Whilst ocular rosacea can occur in patients with quite discrete or completely absent cutaneous findings, it is believed that ocular involvement can occur in greater than 50% of patients with rosacea³¹ Symptoms are typically bilateral and include a sensation of dryness, tired eyes due to oedema, blurry vision, pain, burning, tearing, light sensitivity, itchiness, irritation, gritty sensation in the eyes, and foreign body sensation³² Potential complications include conjunctival telangiectasias, conjunctival injection, blepharitis, keratitis, scleritis, iritis, conjunctivitis, styes, chalazions and corneal damage³² There is no correlation between the severity of cutaneous and ocular symptoms
Minor features	
Burning sensation of the skin	
Stinging sensation of the skin	
Dry sensation of the skin	
Oedema	<ul style="list-style-type: none"> Patients may also occasionally develop oedema from recurrent vasodilation, leading to a sense of fullness of the cheeks and a subtle feeling of induration Over time, patients may develop dramatic swelling leading to lymphoedematous changes which can affect the entire face

Adapted from Schaller et al.⁴ and Gallo et al.³²

features instead of categorization by predefined subtypes.⁴ There are no specific tests or investigations to diagnose rosacea. As per the ROSCO consensus guidelines, rosacea features can be organized based on diagnostic, major and minor features. The ROSCO panel agreed that the two phenotypical presentations diagnostic of rosacea in the absence of other features are phymatous changes and persistent erythema associated with periodic intensification by potential trigger factors. Having one or both of these features is sufficient for a diagnosis. Given the challenges in the subtype approach to diagnosing rosacea, the ROSCO

panel agreed that both minor and major features of rosacea must appear in combination in order to be diagnostic, with no fixed number of major or minor criteria needed to be met. See Table 1 for a list of the diagnostic, major and minor features of rosacea.

Clinical features of rosacea in skin of colour

Despite persistent facial erythema and telangiectasias being observed in patients with skin of colour, they are

less often reported than papules and pustules likely because of the difficulty in their visualization in patients with darker skin.³³ Moreover, postinflammatory hyperpigmentation is more commonly seen in skin of colour, which can also mask facial erythema.^{34,35} As a result, early or mild cases of rosacea may cause less cosmetic disfigurement, prompting fewer visits to the physician by patients and leading to underdiagnosis. This may be why there is a lower index of suspicion for rosacea amongst darker-skinned individuals.³⁰

Although data are limited, there are documented clinical characteristics of rosacea amongst people with skin of colour. This includes a greater proportion of individuals with the papulopustular subtype^{36,37} and granulomatous subtype,³⁸ higher proportion of women affected than men,⁶ sun exposure as a frequent trigger,^{12,37} prior misdiagnoses^{9,39} and symptoms that persist more than a year.^{33,40}

Diagnosis of rosacea in skin of colour

The diagnosis of rosacea is made based on clinical assessment. Given that erythema and telangiectasia are more difficult to visualize in individuals of darker skin tone, there is a risk of misdiagnosis. Therefore, clinicians should pay greater attention to other elements of the patient's history. Features such as a history of facial stinging or burning sensation, experiences of facial flushing, a history of acne diagnosis and failed acne treatments, can all help with diagnosis in patients with highly pigmented skin.⁶

It is also important to identify key clinical signs of rosacea on physical examination. Although the presence of erythema and telangiectasia are more challenging to identify due to the effect of skin pigmentation, having a greater awareness for other signs is paramount when evaluating patients with skin of colour. Other than erythema and telangiectasia, clinicians should look for other signs such as xerosis or scale, oedema, facial acneiform papules and pustules, and hyperpigmentation.⁶ The absence of comedones in the presence of inflammatory papules and pustules continues to be a differentiating clinical feature when compared to acne vulgaris.

Various diagnostic techniques are available when assessing whether erythema or telangiectasia are present. Dermoscopy may help with being able to identify telangiectasia by differentiating skin pigment *versus* blood vessels.⁶ With the use of diascopy, pressing a magnifying glass or microscope slide against the skin and assessing for blanching can help with identifying erythema. It is important to have adequate lighting when assessing telangiectasia in dark skin. In addition, photographing patients on a dark blue background can make erythema more evident.⁶

Skin biopsies are rarely indicated in diagnosing rosacea as the cutaneous histopathological findings are non-specific. A skin biopsy may be used to rule out other disorders or to support a diagnosis for granulomatous rosacea⁴¹ or can be used to test for comorbidities such as demodicidosis (*Demodex folliculitis*).³⁶

Differential diagnoses

There are a variety of conditions that are commonly mistaken for rosacea in patients with skin of colour. The differential diagnosis to consider when considering rosacea include acne vulgaris, topical corticosteroid-induced acneiform eruptions, contact dermatitis, seborrheic dermatitis, periorificial dermatitis, facial Afro-Caribbean childhood eruption, keratosis pilaris rubra faciei, demodicidosis, acute cutaneous lupus erythematosus, sarcoidosis and dermatomyositis.⁶

Treatment

The approach to treating rosacea amongst patients with skin of colour parallels the treatment approach in lighter skin tones. Similar treatment options, including non-pharmacological, topical, oral, laser and light-based treatments, are used in both patients with skin of colour and those with lighter skin tones. However, there are limited data on the treatment of rosacea amongst patients with skin of colour.⁴²

Patients with skin of colour have unique clinical features that should be considered during management. The histological differences in skin structure and cultural preferences may impact the choice of supportive skincare and topical treatment vehicles used in skin of colour. Additionally, patients with darker skin tones are at greater risk for unwanted side effects such as postinflammatory hypopigmentation or hyperpigmentation.⁴³

General measures/non-pharmacological

All patients with rosacea should be counselled about the non-pharmacological interventions for the cutaneous manifestations of rosacea. These include avoiding common triggers of flushing, skincare, sun protection and the use of cosmetic camouflage.

Avoidance of flushing

Flushing is a common feature of rosacea. Patients should be counselled on the avoidance of triggers of flushing, including extremes of temperature, sun exposure, hot beverages, spicy foods and alcohol.⁴⁴ In darker phototypes, patients may identify more closely with the sensation of flushing rather than the classic intensification of erythema.

Skincare

Patients with rosacea commonly experience greater sensitivity of facial skin characterized by difficulty tolerating topical

medications, skincare products and cosmetics.⁴⁵ Thus, a gentle skincare regimen may be helpful in reducing symptoms.

Use of a non-foaming cleanser at least once daily to preserve the skin barrier and remove excess sebum, environmental debris and microorganisms (e.g. *Demodex*) is recommended. Use of lukewarm water and avoidance of washcloths and cleansing tools is also helpful. Traditional soap cleansers that are alkaline, including glycerine and black soap, are not recommended as they can raise the pH of the skin and thus impair skin barrier function.⁴⁶

One recent review investigated the differences in stratum corneum function by examining transepidermal

water loss (TEWL) measurements in skin of colour and white skin. The data from the review demonstrate that no conclusion can be made as to whether individuals with skin of colour or those with white skin have greater TEWL.⁴⁷ Regardless, the use of non-occlusive moisturizers has been shown to help maintain skin barrier integrity through the prevention of TEWL and should be used in all skin types.^{48,49} Light, water-based moisturizers tend to be best, whilst gels and thin lotions should be avoided.⁵⁰ The use of rich, oil-containing cosmeceuticals, including essential oils, is known to disrupt skin barrier function in all skin types but particularly in rosacea.

Table 2. Common topical and systemic therapies for the management of rosacea.

Treatment	Comments
Topical therapies	
Metronidazole (1% gel or cream) once or twice daily	May cause dryness, itching, burning and stinging; effective against pustules, papules and, to a lesser degree, erythema
Sodium sulfacetamide (10%) and sulfur (5%) in a cream or lotion once or twice daily	May cause mild-to-moderate dryness and transient pruritus; effective against pustules and papules; risk of postinflammatory hyperpigmentation
Azelaic acid (15% gel or foam; 20% cream) twice daily	May be as or more effective than metronidazole; risk of postinflammatory hyperpigmentation
Brimonidine tartrate (0.33% gel) once daily	May cause rebound facial flushing, burning sensation, allergic contact dermatitis; can temporarily improve facial erythema
Oxymetazoline hydrochloride (1% cream) once daily	May cause site dermatitis, pain, paraesthesia, pruritus and worsening inflammatory lesions of rosacea; can temporarily improve facial erythema
Ivermectin (1% cream) once daily	May cause burning and skin irritation; effective against improve papules, pustules and erythema
Systemic therapies	
Tetracycline 250–500 mg twice daily for 4–8 weeks	Effective against papules, pustules and erythema
Doxycycline 40 mg daily (30 mg immediate release and 10 mg delayed release) for 4–8 weeks or doxycycline at 50–100 mg, once or twice daily for 4–8 weeks	Effective against papules, pustules and erythema
Minocycline 50–100 mg twice daily or sustained action formula (1 mg/kg) daily for 4–8 weeks	Effective against papules, pustules and erythema
Other antibiotics: clarithromycin at 250–500 mg once or twice daily for 4–8 weeks, azithromycin at 250–500 mg (5–10 mg/kg) thrice weekly for 4–8 weeks, and Metronidazole 200 mg once or twice daily for 4–8 weeks	Effective against papules, pustules and erythema
Isotretinoin 0.25–0.30 mg/kg for 12–16 weeks	Effective for severe, recalcitrant papulopustular rosacea that fails to respond to either topical therapies and/or oral antibiotics May cause cheilitis, dry mouth and lips, myalgia, epistaxis, increased alanine aminotransferase levels, increased triglyceride level, and birth defects
Oral beta-blockers: propranolol 20–40 mg twice or thrice daily, carvedilol 6.25 mg twice or thrice daily	May improve facial erythema and flushing; can cause hypotension, bradycardia, dizziness

Lastly, patients should avoid the use of skincare that can potentially irritate the skin, including toners, astringents and chemical exfoliants (e.g. α -hydroxy acids).⁵⁰ Similarly, antioxidant use should be approached conservatively.

Sun protection

UV radiation may induce cutaneous changes that can promote rosacea and be a stimulus for facial flushing and redness. Differences in photoprotective behaviours in darker phototypes have been documented where sunscreen use and other sun-protective behaviours are less commonly adopted.²⁰ Whilst photoprotection is a key part of any rosacea treatment plan, patients with darker skin tones may report an unappealing white residue or cast as a barrier to regular physical sunscreen use.⁵¹ In these scenarios, it may be more effective to recommend a tinted physical sunscreen. In all phototypes, broad-spectrum sunscreen with a minimum SPF of 30 is recommended.

Cosmetic camouflage

Cosmetic products, particularly green-tinted or yellow-tinted foundation, can be used to effectively camouflage or mask the presence of facial erythema and/or telangiectasias.⁵² In patients with skin of colour, colour matching of cosmetic camouflage products may be challenging due to limited availability in stores and limitations in colour palette. As a result, some patients may mix several products,⁵³ which may not always be tolerated in patients with rosacea.

Topical and systemic therapies

In addition to the general skincare recommendations that are recommended to all patients with rosacea, there are numerous common topical and systemic therapies available (Table 2). Particular consideration should be given to topicals that may induce irritation, where in skin of colour may result in postinflammatory hyperpigmentation.

Laser and light therapy

In skin of colour, treatment of facial erythema and telangiectasias associated with rosacea is largely used in Fitzpatrick phototypes III and IV. Vascular lasers (e.g. pulse-dyed laser, Nd:YAG laser therapy, potassium titanyl phosphate) and intense pulsed light-based therapy can be used; however, the risk of device-associated dyspigmentation is potentially higher in skin of colour given the competing melanin chromophore. The risk of haemosiderin pigmentation from resolving purpura may also be higher. Individuals with darker skin also have more labile melanocytes and reactive fibroblast responses, increasing the overall risk of keloids and hypertrophic scars compared to white individuals.⁵⁴ Conservative vascular laser treatment settings, including lower fluence and longer pulse duration, should be implemented to minimize the risk of scarring and postinflammatory

hyperpigmentation when approaching laser therapy in patients with skin of colour.⁴³

Management of phymatous rosacea

Given the potential delay in rosacea diagnosis in darker phototypes, some patients may present with phymatous involvement. Within the early stages of phymatous rosacea, some reports have shown improvement in phymatous skin with the use of 0.3–1 mg/kg/day of oral isotretinoin administered for a period of 12–28 weeks.^{55,56} However, conclusive evidence is lacking. With more advanced, severe disease, various surgical and laser therapies are available to debulk and recontour phymatous tissue, leading to more long-term improvement. Laser options include carbon dioxide lasers⁵⁷ and infrared diode lasers.^{58,59} Surgical management can be performed through surgical paring/sculpting, electrosurgery, dermabrasion or cryosurgery.^{60–62} Laser and surgical management of phymatous rosacea is a well-accepted first-line modality that can have a significant impact on a patient's quality of life. Whilst these treatments can yield excellent cosmetic outcomes in experienced hands, the risk of scarring and dyspigmentation is high in any phototype. Therefore, these procedures should only be performed by those with a significant degree of experience when approaching treatment in patients with skin of colour.

Limitations

One of the limitations of this manuscript is that there is a lack of information in the literature available surrounding the topic of rosacea in skin of colour. It is the authors' hope that summarizing the relevant clinical literature here will help to raise awareness of some of the clinical similarities and differences seen in the management of rosacea amongst those with skin of colour. Further research and investigations are needed to understand how the pathophysiology of rosacea differs amongst those with skin of colour. This would perhaps help healthcare providers in developing more targeted therapies for this condition.

Conclusion

Rosacea has been reported less frequently in individuals with skin of colour compared to those with white skin; however, rosacea is not a rare disease. Our knowledge and gaps in practice are contributing factors to the under-detection, misdiagnosis and delayed diagnosis in populations with darker skin tones. Having a higher index of suspicion for rosacea amongst patients with darker skin and real-world clinical strategies for recognizing and managing this disease may support timely diagnosis and appropriate management. This may help reduce the disparities in managing rosacea across our diverse patient population.

Key practice points

- Rosacea is more common in skin of colour than previously described – physicians should have a high index of suspicion where patients describe skin sensitivity to common triggers.
- Rosacea should be on the differential where the patient presents with acneiform lesions without comedones or acne not responding to therapy.
- Erythema may not always be appreciable in skin of colour – a thorough history for triggers and flushing sensation is key.
- Sun protection is a key preventive measure for rosacea in all phototypes.
- Recognize the limitations with colour matching camouflage make-up and some forms of sun protection in skin of colour.
- The prescription vehicle is key for adherence – most patients will prefer a topical cream over gel.
- Beware of postinflammatory hyperpigmentation risk with irritating cosmeceuticals and topical therapies for rosacea in skin of colour.
- Redness-reducing prescription topical therapies are most appropriate in Fitzpatrick skin phototypes III and IV.
- Laser interventions for the vascular and phymatous components of rosacea may be appropriate treatment options for rosacea in skin of colour. Patients should be directed to practitioners with experience in this area to limit potential adverse events.
- Rosacea is a chronic inflammatory skin condition that requires active treatment during flares and preventive strategies to limit their recurrence – this is a key element that must be highlighted to all patients.

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