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Short Communication

FDA approves Ruxolitinib (Opzelura) for Vitiligo Therapy: A breakthrough in the field of dermatology

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ABSTRACT

The Food and Drug Administration (FDA) has authorized Ruxolitinib (Opzelura), as first at-home treatment for non-segmental vitiligo, an autoimmune condition that causes spots and patches of paler skin. Previously, it was used to treat atopic dermatitis, myelofibrosis, essential thrombocythemia, and polycythemia vera. It functions by lowering an individual's enhanced immune response, gradually promoting the development of new, healthy skin cells, and ultimately reintroducing pigment to the afflicted area. Using this topical lotion twice daily can not only produce even skin tones but also boost patients' self-esteem because vitiligo can be physically and psychologically upsetting. It is comparatively more efficacious and has a better safety profile than the oral forms of this medicine, although adverse effects such acne, redness, and itching at the application site, inflammation of the throat and nasal passages, headaches and fever have been observed, necessitating the need for observational studies and randomized controlled trials to demonstrate its efficacy and safety.

On July 18, the US Food and Drug Administration (FDA) based on clinical trials approved topical Ruxolitinib (Opzelura) 1.5% in patients 12 years of age or older for the treatment of non-segmental vitiligo [1].

Vitiligo is a chronic autoimmune condition that causes white macules of the skin due to an acquired lack of functional melanocytes with highly obvious, disfiguring lesions [2]. It affects 0.5–2% of the world population, with prevalence varying geographically. India (8.8%) and Mexico have the highest recorded incidences (2.6–4%) [3] It is a complex disorder with both inherited and environmental factors that impact all skin types and affects both men and women equally. It may appear ill-defined and hypo-pigmented at first or during the disease's rapid spread. The lesions may itch and are prone to sunburn [3,4]. It can occur everywhere on the body, particularly on the face (most common), hands, genital and periorificial areas [5].

There are numerous theories as to how melanocytes are destroyed in vitiligo. The primary cause could involve the release and accumulation of reactive oxygen species (ROS) from melanocytes in response to oxidative stress [2]. Studies revealed that patient's skin exhibits abnormal activation of innate immune cells, which may locally produce cytokines that attract and activate cytotoxic auto-reactive T-cells that are directed towards specific antigens such melanoma antigen recognized by T-cells (MART1), tyrosinase, gp100 and tyrosinase-related proteins 1 and 2 in the blood and skin, subsequently killing the melanocytes [6,7]. Among the various cytokines produced by $CD8^+$ T-lymphocytes from lesions are interferon-y (IFN-y) and tumor necrosis factor. IFN-y is required for disease progression and boosts the production of skin-reactive $CD8^+$ T-lymphocytes [8]. The JAK1 and JAK2 kinases are recruited by the IFN-γ-bound receptor complex, which then phosphorylates STAT and translocates it to the nucleus, where it activates IFN-y-inducible genes such as T cell chemokine receptor (CXCR3) and its many ligands CXC chemokine ligand 9 (CXCL9), CXCL10, and CXCL11 to be significantly expressed in the depigmented skin lesions [9,10]. Latest studies implicated that keratinocytes are also crucial for T-cell recruitment since they also produce cytokines [11]. Some have proposed the "neural hypothesis", which contends that the nervous system contributes to the pathophysiology of the condition [12].

It is diagnosed clinically using a Wood's lamp, a handheld ultraviolet (UV) irradiation equipment releasing ultraviolet A (UVA) photons [13]. Common conditions with comparable symptoms include tinea versicolor, nevus depigmentosus, and idiopathic guttate hypomelanosis. Histopathology can assist in confirming a diagnosis by demonstrating the absence of the melanocytes with a little infiltration of inflammatory cells [3].It can be physically disfiguring, psychologically uncomfortable, and socially stigmatizing due to conspicuous spots, having a considerable detrimental influence on the sufferer's life. Psychological research on patients' conditions also revealed thoughts of deformity, stress,

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depression, low self-esteem, sleeping and sexual problems [14]. Treating it is one of the most challenging dermatological problems. Combining phototherapy, topical and systemic immunosuppressants, and surgical techniques may aid to some degree to stabilize depigmented regions, encourage repigmentation and delay the course of the illness [2]. Although phototherapy lessens autoimmune melanocyte destruction, acute side effects such as itching, erythema, and xerosis may occur [15]. A few JAK inhibitors with some therapeutic potential include tofacitinib, baricitinib, ritelcitinib, and cerdulatinib; however, no authorized clinical trials have yet been conducted to examine their usage. To ascertain their efficacy and safety, further research is needed [16].

Ruxolitinib, a JAK 1 and 2 inhibitor, can suppress IFN-y- signaling via the JAK-STAT pathway [16]. It is a chimeric anti-CD20 antibody that binds to CD20-positive cells (pre-B and mature B cells) and causes cell death. B cell engagement with other immune cells lowers T-cell modifying cytokine generation, interferes with auto-antigen presentation and processing, and reduces the activation of auto-reactive diseases. It also inhibited the differentiation and migration of human dendritic cells (DCs). This reduced the development of $CD8^+$ cytotoxic T cell, $CD4^+$ and $CD8^+$ antigen-specific T cell responses, and other key cell responses known to contribute to pathogenesis [17]. The findings of a recent randomized controlled trials supported the use of ruxolitinib cream for treating vitiligo, 1.5% cream was administered twice daily to a series of vitiligo patients, and it was shown to exhibit clinically significant repigmentation of all body locations, including the notably challenging-to-repigment acral region after 24 weeks, with continued improvement through week 52, and was well tolerated, in patients with long-standing severe illness [18].

It is a white to off-white oil-in-water, solubilized emulsion cream with a maximum dosage of 60 g per week [19]. Common adverse reactions included application-site acne, redness and itching, inflammation of the throat and nasal passages, headaches, urinary tract infections, and fever; as a result, when experiencing such a reaction, the medication should be stopped immediately, and any possible causes should be further investigated. There are considerable side effects of oral JAK inhibitors; increased risk of serious infections, significant heart problems, and clotting (thrombosis). Therefore, topical administration of the drug results in improved drug delivery, fast onset of action, and relatively low bioavailability, which enables the targeted distribution of the active medication to skin lesions while minimizing the safety concerns related to oral administration [1]. The FDA has previously approved this medication for the treatment of polycythemia vera, essential thrombocythemia, myelofibrosis and atopic dermatitis [16,20]. Its usage is not recommended in cases of severe infection, hypersensitivity to any substance in the preparation, uncontrolled heart disease and pregnancy. Authorization of this drug will undoubtedly increase access to the medication by establishing its medical necessity, which will also improve patients' quality of life and help them boost their confidence which often gets shattered due to cosmetic concerns and social stigma associated with this skin condition. Furthermore, with the approval of easy-to-use topical medication Opzelura, which includes 15 mg of ruxolitinb, patients with unpigmented skin patches can finally obtain even skin tones. However, more research is required to examine the drug's effectiveness and safety as well as acquire the latest information about its daily dose and administration.

Ethical approval

This paper did not involve patients, therefore no ethical approval was required.

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Author contribution

Ayesha Sheikh: conception of the study, drafting of the work, final approval and agreeing to the accuracy of the work. Warisha Rafique: conception of the study, drafting of the work, final approval and agreeing to the accuracy of the work. Rabia Owais: conception of the study, drafting of the work, final approval and agreeing to the accuracy of the work. Farheen Malik: conception of the study, drafting of the work, final approval and agreeing to the accuracy of the work. Eman Ali: conception of the study, drafting of the work, final approval and agreeing to the accuracy of the work.

Registration of research studies

1 Name of the registry: Not applicable.

2 Unique Identifying number or registration ID: Not applicable.

3 Hyperlink to your specific registration (must be publicly accessible and will be checked): Not applicable.

Guarantor

Ayesha Sheikh, Warisha Rafique, Rabia Owais, Farheen Malik, Eman Ali.

Declaration of competing interest

The authors declare that there is no conflict of interest.

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