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Exploring the natural and treatment history of vitiligo: perceptions of patients and healthcare professionals from the global VALIANT study

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Abstract

Background Vitiligo is a chronic autoimmune disease affecting melanocytes, resulting in skin depigmentation. Patients with vitiligo often have reduced quality of life and comorbid autoimmune conditions and have reported a lack of available treatments for their vitiligo.

Objectives The Vitiligo and Life Impact Among International Communities (VALIANT) study is the first global survey to explore the natural history and management of vitiligo from the perspectives of patients and healthcare professionals (HCPs).

Methods The survey recruited adults (≥ 18 years) diagnosed with vitiligo and HCPs treating patients with vitiligo via an online panel in 17 countries. Patients were queried regarding clinical characteristics and vitiligo treatment. HCPs were queried regarding diagnosis and management of patients with vitiligo.

Results Included in the analysis were 3541 patients and 1203 HCPs. Nearly half (45.2%) of the patients had > 5% affected body surface area; 57.1% reported family history. Patients obtained formal diagnosis after a mean (SD) of 2.4 (4.1) years; 44.9% reported previous misdiagnosis. Many patients (56.7%) reported being told that vitiligo could not be treated; 53.9% of HCPs believed patients who never treated their vitiligo had been told that vitiligo could not be treated. One-quarter of HCPs (26.3%) did not believe that an effective therapy for vitiligo exists; 44.6% of patients reported giving up on finding an effective therapy. Top treatment goals for patients and HCPs, respectively, were reduction or cessation of spread (24.7% and 18.5%) and repigmentation (22.5% and 37.2%). Patient perception of effective care was similar for treatment by dermatologists (66.9%) and primary care HCPs (67.0%).

Conclusions Patients with vitiligo and HCPs reported similar treatment goals and expressed frustration with the lack of effective therapies. Patients reported high rates of initial misdiagnosis; many ceased seeking healthcare because they perceived that vitiligo could not be treated. The findings highlight the need for earlier diagnosis and improved disease management for vitiligo.

What is already known about this topic?

- Vitiligo is a disfiguring pigmentation disorder that severely affects the patient's quality of life, with patients who have a greater extent of disease experiencing a greater burden.
- Approaches to treatment vary by geographic region; it was reported that patients have not found treatment beneficial and have felt that healthcare professionals (HCPs) dismissed their vitiligo as a trivial or cosmetic condition.
- Further, treatment goals between patients and HCPs are not always aligned.

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What does this study add?

- This is the first global survey to explore the natural history and treatment of vitiligo from the perspectives of patients and HCPs.
- Nearly half the patients had > 5% affected body surface area. The mean time to diagnosis was 2.4 years, and nearly half reported an initial misdiagnosis.
- Patients and HCPs shared common treatment goals and frustrations regarding effective therapy.
- Patients did not perceive differences in care between dermatology and primary care HCPs.

What are the clinical implications of the work?

- Earlier diagnosis of vitiligo and improved disease management are needed.
- Greater focus should be placed on ensuring patients are aware of the availability of treatments to manage their vitiligo, which can be achieved through improved HCP–patient communication.
- Furthermore, the patients' perception that primary care HCPs provide equivalent care to dermatologists may be an opportunity to facilitate delivery of dermatology-coordinated multidisciplinary management supported by primary care HCPs.

Vitiligo is a chronic autoimmune disease in which melanocyte destruction results in progressively depigmented patches of skin.[1] Vitiligo has an estimated global prevalence of 0.5–2%, varying geographically; the disease occurs regardless of ethnicity, sex or skin type.[1–3] Vitiligo is associated with increased rates of other autoimmune conditions, depression and anxiety vs. respective rates among individuals without vitiligo.[4–10] Additionally, vitiligo was reported to have a comparable or worse impact on quality of life (QoL) and/or psychological impairment compared with other skin diseases, including eczema and psoriasis.[11–13] Extensive body surface area (BSA) involvement and presence of visible lesions were previously associated with greater psychosocial and QoL burden.[11]

Vitiligo management requires understanding the disease mechanism and having realistic expectations regarding the need for long-term therapy.[14] However, many patients feel that their treatments were not beneficial or that their healthcare professionals (HCPs) dismissed their vitiligo as cosmetic or trivial.[15,16] Moreover, a recent survey highlighted the demand for new and improved vitiligo therapies.[17]

No approved treatment existed for vitiligo repigmentation before the 2022 US Food and Drug Administration approval of ruxolitinib cream for the treatment of nonsegmental vitiligo in patients aged ≥ 12 years.[1] There is a need to understand the experiences of patients with vitiligo with varying disease characteristics. Furthermore, there is a need to better understand the diagnosis, management and disease burden of vitiligo in the real world from the perspectives of patients and HCPs, including shared decision making.[18] The population-based Vitiligo and Life Impact Among International Communities (VALIANT) study surveyed patients and HCPs worldwide regarding vitiligo disease state, impact and management and the relationship between patients and HCPs. Here we describe our findings on the natural history, diagnosis and management of vitiligo from patient and physician perspectives and their communication and treatment goals.

Patients and methods

Study design and participants

This was a cross-sectional observational survey study of adults (aged ≥ 18 years) conducted from 6 May to 21 June 2021, in patients with HCP-diagnosed vitiligo and HCPs who treat patients with vitiligo. Patients were recruited using a general population sampling approach from an opt-in network of potential participants in 17 countries across several regions: Africa/Middle East (Egypt, Saudi Arabia, South Africa), Asia (China, India, Japan, Philippines, Thailand), Australia, Brazil, Canada, Europe (France, Germany, Italy, Spain, the UK) and the USA. Providers were recruited using an opt-in HCP panel in the same 17 countries; HCPs were pre-identified by their specialty (Supplemental Methods; see Supporting Information) and invited to participate in a randomized fashion, with quotas for each region. Eligibility criteria for HCPs are provided in the Supplemental Methods. Face-to-face interviews were permitted in markets with less accessible internet, if needed. Participants who completed the survey were eligible for compensation, which varied by country and participant (patient or HCP by provider type).

The study was performed in accordance with the Declaration of Helsinki and in adherence to the study protocol and local regulatory requirements. All survey participants provided informed consent at screening and could withdraw consent at any time. The study protocol received an exemption from the Western Institutional Review Board.

Survey instrument

The survey was designed by Envision Health Partners and Incyte Corporation, with input and refinement provided by the VALIANT steering committee, and translated into local languages. Patients and HCPs completed a brief online screener designed to capture high-level demographics (e.g. age, sex), confirmation of vitiligo diagnosis for patients and practices related to vitiligo treatment for HCPs, and consent before proceeding to the full survey. Patients continuing into the 25-min survey were asked questions regarding vitiligo clinical characteristics, including the Self Assessment Vitiligo Extent Score (SA-VES), to estimate vitiligo extent,[19] and questions related to treatment [see Supplemental Methods and Supplement 2 (questionnaire)]. Additional questions aimed to assess relationships and perceived communication barriers with their HCPs. HCPs were administered a 30-min survey with questions regarding how they diagnose, manage and treat vitiligo, including treatment goals [see Supplemental Methods and Supplement 3

(questionnaire)]. The survey also assessed when HCPs might decide to discontinue therapy and the rationale behind such decisions (see Supplemental Methods). The impact of vitiligo on patients as perceived by HCPs was also explored.

Statistical analyses

The target survey sample size was approximately 3500 patients and 1200 HCPs. Replacement of patients and providers was permitted following screening failures. Respondents discontinuing for any reason were not included in the analysis set. Respondents were removed from the analysis set for data quality issues [e.g. straight-lining, nonsensical responses or completing the survey too quickly to have thoroughly read and responded to all questions (patients, <8 min; HCPs, <9 min)]. Demographic characteristics were collected for comparison to expected geographical distributions to minimize selection bias. Data were summarized descriptively; mean (SD) and median (range) were tabulated for continuous variables and percentages for discrete variables. Statistical comparisons (*t*-tests for means and χ^2 for categorical counts) were made between subgroups (e.g. geographic region, Fitzpatrick skin type, vitiligo extent, presence of facial lesions), with significance conferred at $P<0.05$; no corrections were made for multiple testing. The study was not powered to test any formal hypotheses. Analyses were considered hypothesis-generating.

Results

Patient characteristics

The survey was sent to 881 522 potential participants, with 197 858 participants clicking the link and 5859 reporting a vitiligo diagnosis. Of those with a vitiligo diagnosis, 3919 (66.9%) completed the survey; after exclusion of 378 patient respondents for data quality issues, 3541 (60.4%) were included in the analysis (Table S1; see Supporting Information). Among all included patients, the median (range) age was 38 (18–95) years, and over half (54.6%) were male (Table 1). More patients reported Fitzpatrick skin types I–III (fairer skin, 59.2%) than types IV–VI (darker skin, 40.8%). The median (range) age at diagnosis was 30 (0–95) years, with mean (SD) disease duration of 12.7 (12.6) years (Table 1). The median (range) of affected BSA, estimated by SA-VES, was 4.0% (0%–73.9%) (Figure S1; see Supporting Information). Nearly half the patients (45.2%) had >5% affected BSA and 60.5% had facial lesions. Over half (57.1%) reported a family history of vitiligo, with increased rates among patients with darker skin (69.0% vs. 48.9% for fairer skin, $P<0.05$), more extensive disease (>5% affected BSA, 71.2% vs. 52.4% for 1%–5% BSA and 38.8% for <1% BSA; $P<0.05$) and facial lesions (64.3% vs. 45.0% for no facial lesions, $P<0.05$).

Patients with >5% affected BSA were significantly younger ($P<0.05$) at first lesion appearance [mean (SD), 27.3 (12.9) years] than those with 1–5% BSA [29.3 (12.6) years] or <1% BSA [31.8 (14.4) years]. The mean (SD) time between first noticing lesions and achieving a formal vitiligo diagnosis was 2.4 (4.1) years; lesions most commonly first appeared on the hands (40.0%) and face (38.6%). Many patients (57.5%) reported that vitiligo affected both sides of their body. Most patients reported slow (36.0%) or rapid (31.9%) vitiligo progression; 8.4% reported no progression after first appearance of lesions.

Table 1 Patient demographics and clinical characteristics

Characteristic	All patients ($N=3541$)
Age, median (range), years	38 (18–95)
Male, *n* (%)	1933 (54.6)
Fitzpatrick skin type,[a] *n* (%)	
I–III	2096 (59.2)
IV–VI	1445 (40.8)
Geographic region, *n* (%)	
Africa/Middle East	201 (5.7)
Asia	1005 (28.4)
Australia	75 (2.1)
Brazil	301 (8.5)
Canada	200 (5.6)
Europe	1151 (32.5)
USA	608 (17.2)
Age at diagnosis, median (range), years	30 (0–95)
Time before diagnosis, mean (SD), years	2.4 (4.1)
Disease duration, mean (SD), years	12.7 (12.6)
Body part vitiligo lesions first appeared, *n* (%)[b]	
Hands	1417 (40.0)
Face	1367 (38.6)
Waist	1141 (32.2)
Legs (front)	1060 (29.9)
Back	1019 (28.8)
Arms (front)	972 (27.4)
Feet	775 (21.9)
Side of body affected, *n* (%)	
On both sides (left and right)	2037 (57.5)
Mostly on one side (left or right)	1397 (39.5)
Not sure	107 (3.0)
Disease progression since diagnosis, *n* (%)	
No progression	299 (8.4)
Slow progression	1274 (36.0)
Stable, then rapid	804 (22.7)
Rapid, no stabilization	414 (11.7)
Rapid at first, then stabilized	524 (14.8)
Rapid, short bursts separated by stabilization	190 (5.4)
Other	36 (1.0)
Affected BSA, median (range), %	4.0 (0–73.9)
<1%, *n* (%)	984 (27.8)
1–5%, *n* (%)	955 (27.0)
>5%, *n* (%)	1602 (45.2)
Stress-induced flares, *n* (%)	2339 (66.1)
Itch before or during flares, *n* (%)	2309 (65.2)
Family history of vitiligo, *n* (%)	2022 (57.1)
Father's side	1250 (35.3)
Mother's side	894 (25.2)
In patients' child(ren)	140 (4.0)

BSA, body surface area.[a]Fitzpatrick skin types are defined as follows: I, pale white skin; II, white skin; III, light-brown skin; IV, moderate-brown skin; V, dark-brown skin; VI, deeply pigmented dark-brown to black skin. [b]Locations reported in >20% of patients are shown.

Physician characteristics

Among 20 659 HCPs invited to participate, 2741 clicked the link and 1256 met the inclusion criteria. Of these, 1223 (97.4%) HCPs completed the survey; after exclusion of 20 HCP respondents for data quality issues, 1203 (95.8%) were included in the analysis (Table S2; see Supporting Information). HCPs reported a mean (SD) of 17.0 (8.3)

years of clinical practice experience. Most HCPs (91.4%) specialized in dermatology, with 8.6% being primary care HCPs (5.5% primary care/family medicine; 3.2% internal medicine). Nonphysicians comprised 0.5% of participating HCPs, with 0.25% each being nurse practitioners (NPs) or physician assistants (PAs). A total of 749 HCPs (62.3%) self-identified as vitiligo specialists, of whom 736 (98.3%) were dermatologists. HCPs treated a mean (SD) of 45.8 (80.2) patients with vitiligo over a typical 3-month period.

Vitiligo diagnosis experience and disease course

Most patients (62.3%) were first diagnosed with vitiligo by a dermatology-focused HCP (59.7% by dermatologist, 2.6% by NP/PA); 35.6% were diagnosed by a primary care HCP (34.1% by family/primary care doctor, 1.4% by NP/PA) and 2.1% were diagnosed by another type of HCP. Almost half the patients globally (44.9%) reported being previously misdiagnosed with a condition other than vitiligo, with geographic variability (Figure 1a). Reported rates of misdiagnosis were greater among patients with darker skin (64.4% vs. 31.4% for fairer skin; $P<0.05$), >5% affected BSA (61.5% vs. 35.4% for 1%–5% BSA and 27.0% for <1% BSA; both $P<0.05$) and facial lesions (54.3% vs. 28.6% for no facial lesions; $P<0.05$). Male (45.5%) and female patients (44.0%) reported similar rates of previous misdiagnoses. Patients treated by a primary care HCP had higher rates of previous misdiagnosis (66.6% overall) than those treated by a dermatologist (40.5%, $P<0.05$). In contrast, 16.4% of HCPs reported having frequently encountered patients who had been previously misdiagnosed, with geographic variability (Figure 1b). Dermatologists (16.2%) and primary care HCPs (18.3%) reported similar rates of encountering patients with previously misdiagnosed vitiligo, as did vitiligo specialists (16.4%) and nonspecialists (16.3%; Figure 1b). Overall, the most common misdiagnoses reported by patients were skin damage (e.g. sunburn, scarring or other skin trauma; 33.6%), fungal infection (27.5%) and atopic dermatitis (25.0%; Figure 2).

Approximately two-thirds (66.1%) of patients noted experiencing flares during periods of stress. Significantly higher rates of flares during or after stressful periods were reported by patients with darker skin (76.1% vs. 59.1% for fairer skin; $P<0.05$), >5% affected BSA (83.6% vs. 61.5% for 1–5% BSA and 41.9% for <1% BSA; both $P<0.05$) or facial lesions (75.2% vs. 51.7% for no facial lesions; $P<0.05$). Female patients reported significantly higher rates of flares during stress (68.1% vs. 64.4% for male patients; $P<0.05$). Additionally, 65.2% of patients reported noticing itching before or during a flare. Significantly higher rates of experiencing itch before or during a flare were reported by patients with darker skin (73.4% vs. 59.6% for fairer skin; $P<0.05$), >5% affected BSA (80.1% vs. 63.4% for 1–5% BSA and 42.7% for <1% BSA; both $P<0.05$) or facial lesions (72.5% vs. 53.8% for no facial lesions; $P<0.05$). Male (66.4%) and female (63.8%) patients reported similar rates of itch before or during flares.

Belief that vitiligo cannot be treated

Many patients (56.7%) reported being told by an HCP that their vitiligo could not be treated, with geographic differences (Figure S2a; see Supporting Information). Patients with darker skin (66.0% vs. 50.3% for fairer skin; $P<0.05$), >5% affected BSA (65.2% vs. 53.5% for 1–5% BSA and 45.9% for <1% BSA; both $P<0.05$) and facial lesions (61.8% vs. 48.7% for no facial lesions; $P<0.05$) were more often told

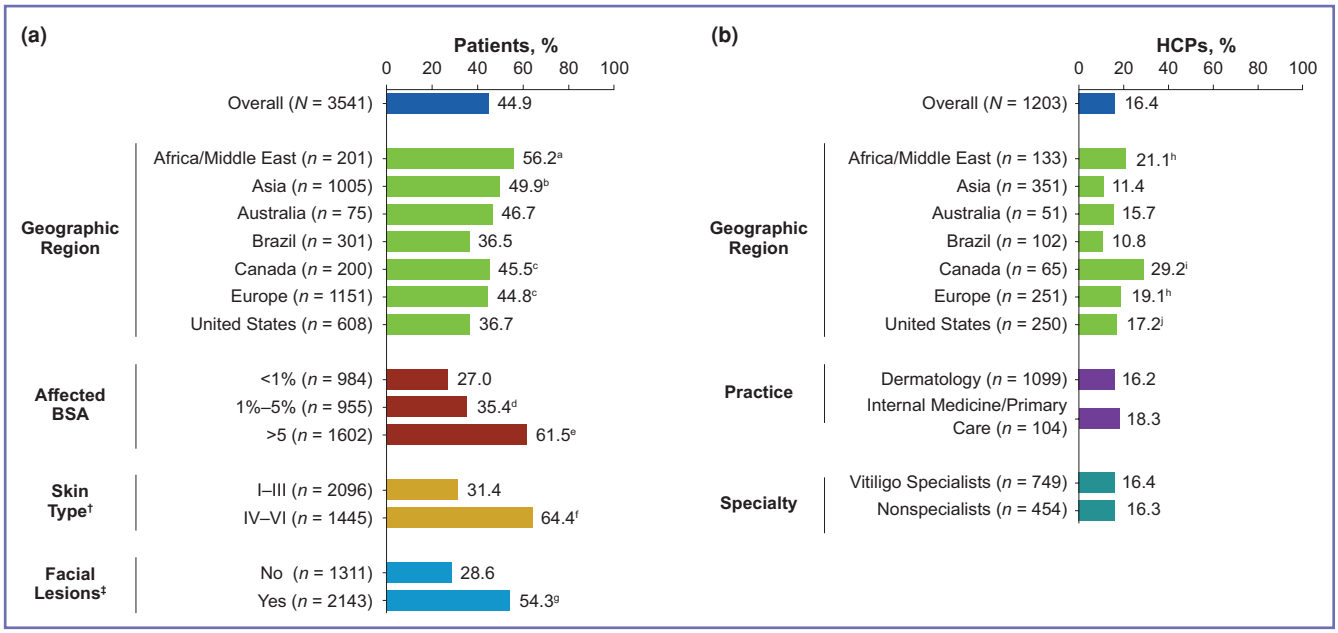

Figure 1 Rates of misdiagnosis (a) received by patients and (b) frequently encountered by healthcare professionals (HCPs).**HCPs frequently encountering patients who had been misdiagnosed included those who responded with 'often', 'very often' or 'all the time' on the questionnaire. †Fitzpatrick skin types I–III were characterized as fairer and types IV–VI as darker skin types. ‡Patients with 0% affected body surface area (BSA) ($n=87$) were excluded from the analysis of facial lesions. [a]$P<0.05$ vs. USA, Europe, Canada and Brazil; [b]$P<0.05$ vs. USA, Europe and Brazil; [c]$P<0.05$ vs. USA and Brazil; [d]$P<0.05$ vs. <1% affected BSA; [e]$P<0.05$ vs. 1%–5% and <1% affected BSA; [f]$P<0.05$ vs. fairer skin types; [g]$P<0.05$ vs. no facial lesions; [h]$P<0.05$ vs. Brazil and Asia; [i]$P<0.05$ vs. USA, Brazil and Asia; and [j]$P<0.05$ vs. Asia.

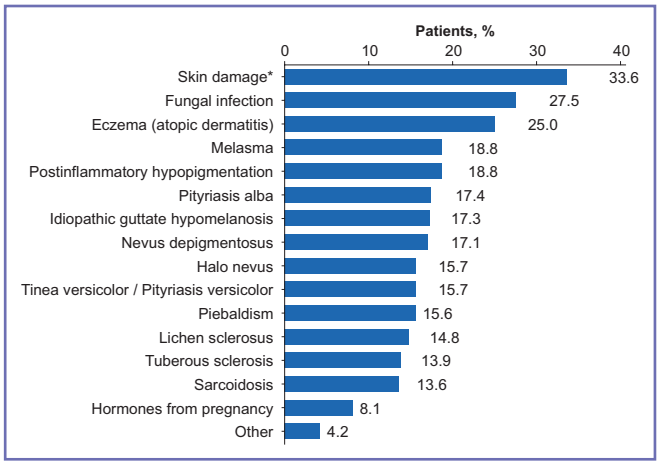

Figure 2 Patient-reported vitiligo misdiagnoses. *Skin damage includes sunburn, scarring or other skin trauma.

that their vitiligo could not be treated. Greater percentages of patients treated by primary care HCPs (68.8% combined) and not currently treated (60.9%) reported being told that their vitiligo was untreatable than patients treated by dermatologists (48.0%; both $P<0.05$). Among HCPs, 53.9% reported believing that patients who never treated their vitiligo had been previously told that no treatment exists, with similar rates by practice/specialty (Figure S2b).

In response to being told by an HCP that their vitiligo could not be treated, 42.2% of patients reported immediately consulting with another HCP. Overall, 36.7% of patients who were told that their vitiligo could not be treated reported never knowing that treatment was available or seeking treatment again, and 44.6% had given up on finding an effective treatment.

Treatment history

Overall, patients used a mean (SD) of 5.9 (4.9) treatments to manage their vitiligo, with more treatments among patients from Australia [7.9 (5.0)], Brazil [6.8 (5.4)] and Africa/Middle East [6.8 (4.4)]. More treatments were used by patients with darker skin [6.5 (5.1) vs. 5.5 (4.7) for fairer skin; $P<0.05$], >5% affected BSA [7.2 (5.2) vs. 5.8 (4.3) for 1–5% BSA and 3.8 (4.0) for <1% BSA; both $P<0.05$] and facial lesions [6.7 (5.1) vs. 4.7 (4.2) for no facial lesions; $P<0.05$]. Female patients used more treatments [6.2 (4.8)] than male patients [5.7 (4.9); $P<0.05$].

Treatment usage differed between patient and HCP reports (Figure 3). HCPs most commonly recommended prescription topical medications (91.4%; 92.7% for dermatology vs. 76.9% for primary care; $P<0.05$), sun protection (86.7%; 86.2% for dermatology vs. 92.3% for primary care; $P<0.05$) and phototherapy (65.7%; 68.0% for dermatology vs. 41.3% for primary care; $P<0.05$), but comparatively fewer patients reported ever using these (62.2%, 62.8% and 49.0%, respectively). Notably, 34.3% of patients reported having surgery or other procedures (e.g. skin grafting, micropigmentation, hormone-stimulating implant), whereas only 14.0% of surveyed HCPs recommended surgery.

Communication and treatment goals

HCPs reported higher rates of frequent effective communication than patients (Figure S3; see Supporting Information). Open dialogue between patients and HCPs was reported by 92.1% of HCPs and 75.4% of patients. Further, 86.4% of HCPs reported that their patients felt comfortable asking them questions, whereas fewer (75.3%) patients reported feeling comfortable doing so. HCPs more frequently stated that they understood the patient burden compared with

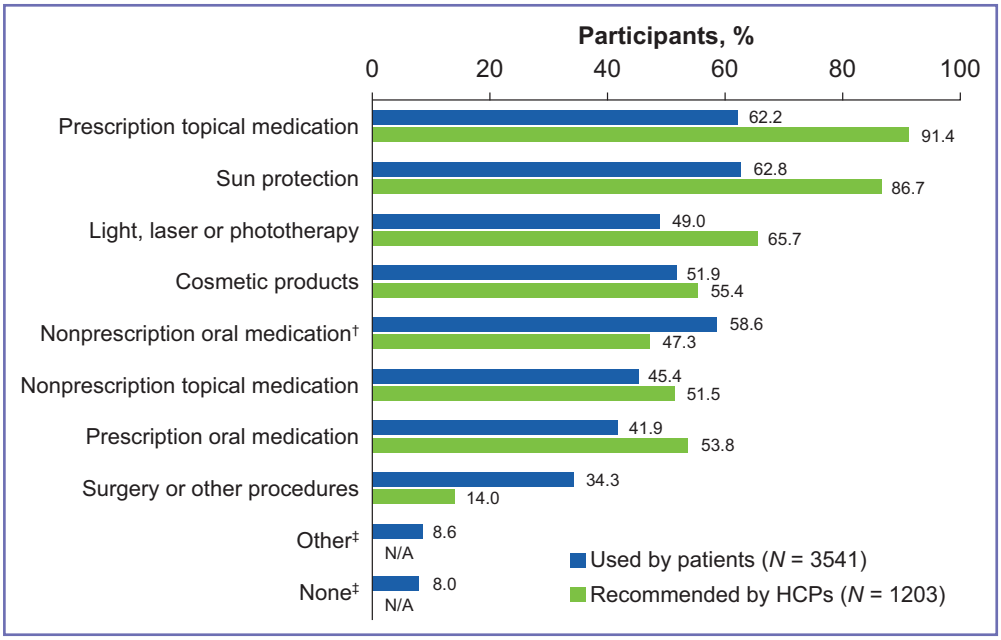

Figure 3 Types of treatments ever used by patients and most frequently recommended by healthcare professionals (HCPs).* N/A, not applicable. *HCPs' frequently recommended medications included those recommended 'often', 'very often' or 'all the time' as per the questionnaire. †Medications include vitamins A and D and other oral nonprescription antioxidants, vitamins or supplements. ‡Option not included in the HCP questionnaire.

patients reporting that their HCPs understood their burden (90.8% vs. 70.8%, respectively). Interestingly, patient perceptions of their provider did not differ meaningfully between those being treated by dermatologists or by primary care HCPs, with two-thirds of patients (66.9% and 67.0%, respectively) reporting effective care.

Patient-reported treatment compliance was higher than HCP-reported compliance estimation (75.0% vs. 51.8%, respectively). Despite this, 14.0% of patients were not currently under the care of an HCP and 14.1% were not actively using treatment, yet 68.7% were still hopeful that a new treatment will become available. Notably, 26.3% of HCPs did not believe effective treatments for vitiligo exist, and 30.5% were neutral.

The top treatment goals among patients and HCPs included reduction or cessation of spread (24.7% and 18.5%, respectively) and repigmentation of affected skin (22.5% and 37.2%; Figure 4). Similar percentages of patients and HCPs (12.7% and 14.4%, respectively) indicated reduction of psychological burden as a top treatment goal. Greater percentages of patients vs. HCPs indicated that their top treatment goals included reducing or stopping itch (12.8% vs. 2.1%, respectively) and depigmenting of healthy skin (10.8% vs. 2.7%).

Discussion

The VALIANT survey is the first international study exploring the views of patients with vitiligo and HCPs treating vitiligo regarding disease management and evaluating geographic differences. The disease burden was profound, with nearly half the patients reporting $>5\%$ affected BSA. These patients often had earlier disease onset and used a greater number of treatments than patients with $\leq 5\%$ affected BSA. Furthermore, approximately two-thirds of the patients reported experiencing vitiligo flares during periods of stress, consistent with findings from the ComPaRe e-cohort.[20] Additionally, itching before or during flares was reported in approximately two-thirds of the patients, and prescription topical treatments were recommended by over 90% of HCPs and used by approximately two-thirds of the patients. These findings reinforce that vitiligo is not merely cosmetic.[4]

Over half the patients surveyed reported a family history of vitiligo, with greater rates among patients with greater disease extent, darker skin and facial lesions. These findings were considerably higher than previously reported estimates of 10–36%.[21,22] More recently, a genome-wide association study of White European patients suggested that ~80% of vitiligo risk is due to heritability, suggesting previous studies may have underestimated heritability.[14,23] The VALIANT survey extended the definition of positive family history of vitiligo to include first-, second- or third-degree relatives, potentially contributing to the family history rate more closely reflecting genetic heritability.

Patients worldwide reported difficulty receiving a diagnosis, with nearly half reporting being previously misdiagnosed and waiting an average of 2.4 years to receive the correct diagnosis. Notably, patients with darker skin types, more extensive vitiligo or facial lesions particularly experienced difficulties related to accurate diagnosis of vitiligo, which was unexpected given that, from a clinical perspective, these subgroups are considered easier to diagnose. Globally, these differences may partially reflect racial disparities in the quality of healthcare received and cultural issues in seeking and providing treatment for vitiligo. Surprisingly, only 16.4% of HCPs reported encountering patients with previous misdiagnoses. It is likely that patients consulted with less experienced physicians early in their management journey, resulting in misdiagnosis. Indeed, greater percentages of patients being treated by primary care HCPs reported misdiagnoses than those treated by dermatology-focused HCPs. This discordance might be partially attributable to a potential unwillingness of patients to accept an initial vitiligo diagnosis. The negative implications of vitiligo in some cultures (e.g. India)[24,25] may have led some patients to reject an initial vitiligo diagnosis and/or contributed to reluctance of some HCPs to diagnose vitiligo. Despite these differences,

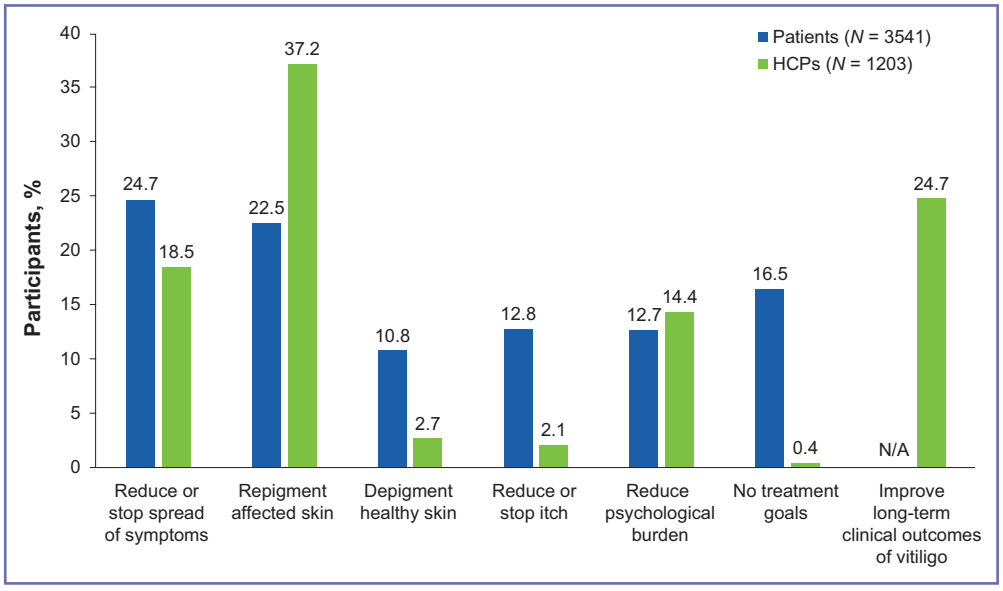

Figure 4 Top treatment goals among patients and healthcare professionals (HCPs). N/A, not applicable (option not included in the patient questionnaire).

patient perceptions of their provider did not meaningfully differ between dermatology-focused and primary care HCPs. This patient perception of similar care in vitiligo management between primary care HCPs and dermatologists could help facilitate the development of a multidisciplinary management approach led by dermatologists and supported by primary care HCPs, which, alongside shared decision making,[18] might result in improved overall management.

Vitiligo was long considered cosmetic by both HCPs and payers.[4,16,26] A UK-based survey found that patients with vitiligo felt primary care HCPs had limited awareness of vitiligo, frequently dismissing it as cosmetic.[16] In this study, although 90.8% of HCPs responded that they understood the burden of patients living with vitiligo, only 70.8% of patients felt that their HCPs understood their disease burden. However, patients and HCPs were not matched in this survey, and patients may have consulted HCPs with considerably less experience in treating vitiligo than the HCPs who were eligible for the current study. Further, this disparity may also be attributed to a feeling among over two-thirds of the patients that their vitiligo cannot be treated. This belief is corroborated by HCPs, among whom over half reported their belief that patients who never treated their vitiligo had been told there is no treatment for the disease. Additionally, over half the HCPs surveyed agreed with or were neutral about the statement that there are no effective therapies for vitiligo. This perception that vitiligo cannot be treated may have led some patients to cease seeking healthcare, with over one-third of the patients who were told that their vitiligo could not be treated never knowing treatment was available or seeking treatment thereafter. This frustration was previously reflected in a survey from the Netherlands, which found that half the patients with vitiligo did not think current therapies were satisfactory and 94% indicated a need for new and improved treatment strategies.[16] These findings were supported on a global scale and further suggest that such dissatisfaction may contribute to a cessation in seeking healthcare. It may also have contributed to over twice as many patients reporting having had surgery or other procedures vs. HCPs recommending these procedures, because patients may have actively sought HCPs who would perform surgical procedures.

Furthermore, very little evidence exists regarding the cost-effectiveness of vitiligo treatment.[27] In the first full economic analysis of vitiligo treatments using standard-care treatment as a comparator, the cost-effectiveness of narrowband ultraviolet B phototherapy in combination with topical corticosteroids vs. topical corticosteroids alone depended on willingness to pay.[28] For patients living in lower-income countries or who do not have access to state-led healthcare, effective treatments may be cost-prohibitive, and affordability of treatments may factor into discussions with their HCP regarding the feasibility of treating their vitiligo.

Some smaller regional studies evaluated patient-reported treatment success and satisfaction. In a study from the UK, a greater percentage of patients vs. physicians defined cessation of spread as important, whereas most physicians considered repigmentation the most desirable outcome. Notably, definitions of repigmentation also varied greatly across survey respondents.[16] A survey from Belgium also demonstrated high motivation for the goal of disease stabilization.[29] An e-Delphi study developed consensus among dermatologists, patients and other stakeholders that repigmentation, including maintenance of repigmentation, and cessation of vitiligo spread should be core outcomes; the International Initiative for Outcomes workshops for patients with vitiligo defined $\geq$25% repigmentation within 3 months of starting treatment as a satisfactory initial outcome.[30,31] In our study, shared top treatment goals among patients and HCPs globally were reduction or cessation of spread and repigmentation of affected skin, validating the consensus from previous studies on a global scale.

Study limitations of this online survey include selection bias and restriction of participants to those with internet access, although efforts were made to conduct in-person interviews in populations with limited internet access if needed to reach desired sample size. Additional limitations include potential measurement errors and recall biases inherent in patient-reported outcomes studies. Patients with fairer skin types and those from the USA were also overrepresented relative to the global population. Furthermore, patients with segmental and nonsegmental vitiligo were included, and data were not separated by type. Compared with segmental vitiligo, nonsegmental vitiligo has been associated with greater rates of stress as an onset factor, itching and positive family history among patients with early-onset disease.[32]

In summary, this study found substantial disease and treatment burden among patients with vitiligo. On average, it took patients 2.4 years to receive a formal vitiligo diagnosis after appearance of the first lesions, with almost half the patients reporting being previously misdiagnosed. Patients and HCPs reported similar treatment goals and a shared frustration with the lack of effective vitiligo therapies; the perception that vitiligo cannot be treated may have led some patients to cease seeking healthcare. Taken together, these findings highlight the need for earlier diagnosis and improved disease management strategies, including improved communication between HCPs and patients in the diagnosis and treatment journey.

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Conflicts of interest

I.H.H. has served as an advisory board member for AbbVie; a consultant for Boehringer Ingelheim, Galderma Laboratories LP, Incyte, Pfizer and UCB; a principal investigator for Avita, Bayer, Estée Lauder, Ferndale Laboratories, Incyte Corporation, Lenicura, L'Oréal, Pfizer and Unigen; immediate past president of the HS Foundation; and a board member of the Global Vitiligo Foundation. K.B. was an employee and shareholder of Incyte at the time of the study.

P.G. has served as a consultant for Aclaris Therapeutics, Clarify Medical, DermaForce, Incyte, Proctor & Gamble and Versicolor Technologies; and as a principal investigator for Aclaris Therapeutics, Allergan/SkinMedica, Clinuvel Pharmaceuticals, Incyte, Johnson & Johnson, L'Oreal, Merz Pharma, Pfizer, Thync Global Inc. and VT Cosmetics. J.E.H. has served as a consultant for AbbVie, Aclaris Therapeutics, BiologicsMD, EMD Serono, Genzyme/Sanofi, Janssen, Pfizer, Rheos Medicines, Sun Pharmaceuticals, TeVido BioDevices, The Expert Institute, 3rd Rock Ventures and Villaris Therapeutics; and as an investigator for Aclaris Therapeutics, Celgene, Dermira, EMD Serono, Genzyme/Sanofi, Incyte, LEO Pharma, Pfizer, Rheos Medicines, Stiefel/GlaxoSmithKline, Sun Pharmaceuticals, TeVido BioDevices and Villaris Therapeutics; holds equity in Aldena Therapeutics, NIRA Biosciences, Rheos Medicines, TeVido BioDevices and Villaris Therapeutics; is a scientific founder of Aldena Therapeutics, NIRA Biosciences and Villaris Therapeutics; and has patents pending for IL-15 blockade for treatment of vitiligo, JAK inhibition with light therapy for vitiligo and CXCR3 antibody depletion for treatment of vitiligo. N.v.G. is a consultant and/or investigator for AbbVie, Incyte, Merck/MSD, Pfizer and Sun Pharma; and is chair of the Vitiligo Task Force for the European Academy of Dermatology and Venereology. D.P. has served as an expert or primary investigator for Incyte, Pfizer and Sun Pharmaceuticals. M.T. has no conflicts of interest to disclose. J.G. has served as a consultant for AbbVie, Avita Medical, Concert Pharmaceuticals, Incyte, Mitsubishi Tanabe Pharma Corporation and Pfizer. Y.V. is CEO of the Vitiligo Research Foundation, has served as a scientific advisor at Temprian Therapeutics, and as an invited professor at Guglielmo Marconi University. G.T.M. is the founder of Beyond Vitiligo South Africa and cofounder of Beyond Vitiligo Botswana. C.L. is a co-owner of Envision Health Partners, who received funding for conducting this project from Incyte. H.R. is an employee and shareholder of Incyte. K.E. is a consultant for AbbVie, Incyte, La Roche-Posay, Pfizer, Pierre Fabre, Sanofi and Viela Bio.

Data availability

Access to individual participant-level data is not publicly available for this study.

Ethics statement

The study protocol received an exemption from the Western Institutional Review Board.

Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website.

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