Dermatol Ther (Heidelb) (2026) 16:1011–1023
https://doi.org/10.1007/s13555-025-01598-6

ORIGINAL RESEARCH

Establishment of the Kenyan Psoriasis Registry: A Case–Control Cohort

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Received: September 15, 2025 / Accepted: November 6, 2025 / Published online: December 20, 2025

ABSTRACT

Introduction: Psoriasis is a chronic inflammatory skin disease with a global prevalence of 1–5%, however its clinical and demographic profile in Kenya remains underexplored. This article describes the establishment of the Kenyan Psoriasis Registry at Moi Teaching and Referral Hospital in Eldoret, Kenya.

Methods: 214 subjects were enrolled between October 2024 and August 2025 at Moi Teaching and Referral Hospital. Both healthy controls and patients with psoriasis completed enrollment surveys and physical exams, and donated saliva samples.

Results: The initial cohort of 214 subjects (108 patients with psoriasis, 106 healthy controls) provides valuable insights into the demographics, clinical profiles, quality of life, and mental health characteristics of patients with psoriasis in Kenya. The mean age of psoriasis onset was 30.4 years, and mean age of diagnosis by a medical provider was 38.9 years old. 13.9% of patients with psoriasis reported a positive family history of psoriasis, and 9.3% of patients with psoriasis reported a diagnosis of psoriatic arthritis. The mean psoriasis area and severity index was 9.9 and mean Investigator Global assessment score was 3.0. Examination of treatment patterns revealed that moisturizers, prescription topical medications, and methotrexate were commonly tried while only 9.3% of individuals had ever received a biologic therapy. Patients with psoriasis reported significantly worse sleep disturbance, quality of life, and mental health compared to healthy controls.

Conclusion: This data highlights the unique characteristics of patients with psoriasis in Kenya. The Kenyan Psoriasis Registry continues to enroll patients and conduct yearly follow-ups, aiming to deepen the understanding of psoriasis in this population. These findings underscore the need for targeted research and advocacy to improve psoriasis care in Kenya.

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Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s13555-025-01598-6.

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Keywords: Psoriasis; Kenya; Global health; Mental health; Quality of life; Sleep

Key Summary Points

The Kenyan Psoriasis Registry establishes the first psoriasis patient registry in Kenya, aiming to elucidate the demographic and clinical profile of psoriasis in this population.

Compared to healthy controls, patients with psoriasis in Kenya report worse sleep disturbance, quality of life, and mental health, highlighting the broader impact of the disease beyond physical symptoms.

This study emphasizes the need for improved research, advocacy, and healthcare access and support for patients with psoriasis in Kenya.

INTRODUCTION

Psoriasis (PsO) is an inflammatory skin disease affecting about 1–5% of the population worldwide [1]. In Kenya, the prevalence of PsO is estimated to be 3.5% [2]; however, little is known about the demographic and clinical profile of patients with PsO in Kenya. While PsO affects all races, there are racial disparities in regard to quality of life, healthcare utilization, treatment, and disease severity among patients with PsO. A 2022 study in the USA showed that patients with skin of color were more likely to receive a biopsy for diagnosis of PsO compared to non-skin of color patients [3]. Furthermore, patients with skin of color waited three times as long to receive a diagnosis of psoriasis compared to non-skin of color patients, and disease at time of initial presentation was more severe [3]. Non-white patients with psoriasis also have significantly longer duration of hospitalization for psoriasis compared to white patients who were hospitalized [4]. In terms of quality of life, psoriasis had a greater effect on health-related quality of life in Black, Asian, and Hispanic/Latino patients compared to White patients in a study of more than 10,000 patients in North America [5]. When investigating factors associated with biologic medications for PsO in the USA, black race was associated with lower likelihood of being prescribed biologics [6].

Within psoriasis clinical trials, non-white patients are also underrepresented [7]. Additionally, of the more than 25 published genome-wide association studies in psoriasis, 21 were performed in European ancestry cohorts, 5 in East Asian cohorts, and zero in Black or Latino cohorts [8]. This dearth of research in diverse cohorts can have profound impacts, as there may be genetic, immunological, and molecular differences in the pathogenesis of psoriasis in skin of color [9].

Ultimately, there is a crucial need to better understand the pathogenesis of psoriasis and clinical and demographic features of patients with psoriasis in diverse populations. To help address this knowledge gap, we have established the first psoriasis patient registry in Kenya: the Kenyan Psoriasis Registry (KPR). The KPR is based at Moi Teaching and Referral Hospital (MTRH) in Eldoret, Kenya. MTRH, one of Kenya's two national referral hospitals, serves approximately 24 million people from Western Kenya and neighboring countries. Greater than 90% of patients seen at MTRH Dermatology are of African ancestry. This registry aims to enroll patients with PsO and healthy controls over the next 10 years, with the objective of characterizing the clinical, demographic, and genetic characteristics of psoriasis in the Kenyan population. This article shares the results of clinical and demographic profile of the first 214 enrolled patients (108 patients with PsO and 106 healthy controls) in the KPR.

METHODS

This single-center observational study was approved by the Moi Teaching and Referral Hospital Institutional Research and Ethics Committee (Approval number 0004848) and University of California, San Francisco (UCSF) Institutional Review Board (IRB # 24-42250). Informed consent was obtained from the participants and their parent/guardian in the event of a minor's

participation. This study was performed in accordance with the Helsinki Declaration of 1964, and its later amendments.

A total of 214 subjects were enrolled between October 2024 and August 2025. Inclusion criteria included patients with a history of dermatologist-confirmed psoriasis. This includes adults and minors aged 3 months to 17 years. Normal, healthy adult volunteers and minor volunteers aged 3 months to 17 years without a history of inflammatory conditions were eligible to participate as controls. All psoriasis subtypes including plaque, guttate, inverse, palmoplantar, pustular, and erythrodermic were included in the registry. Exclusion criteria include the inability to provide informed consent or comply with study procedures including saliva donation. Additionally, patients with comorbid skin conditions that may impede evaluation of psoriasis were not included.

Subjects were recruited via in-person clinical visits at MTRH and physical recruitment flyers posted within MTRH clinical spaces. Subjects were not administered any treatment as part of this registry; their PsO treatments were prescribed by their healthcare providers and these providers maintain discretion over changes in PsO treatment. Subjects were not financially compensated for their participation. All subject data was stored on a secure REDCap database hosted by a UCSF server. Subjects were assigned de-identified unique numerical study identifiers.

Written consent was obtained prior to the start of any study activities. For minors aged 3 months to 13 years, parental consent was obtained. For minors aged 13–17 years, parental consent and minor assent were obtained.

The enrollment questionnaires were completed by the MTRH research coordinator on behalf of enrolled subjects using a REDCap form on a computer while administering the questionnaire verbally to subjects. The data collected is summarized in Table 1. Validated instruments utilized included the following: Hunger Vital Sign™ to assess food insecurity, Psoriasis Epidemiology Screening Tool (PEST) to determine likelihood of psoriatic arthritis, Itch and Pain Numerical Scale, Generalized Anxiety Disorder 7-item (GAD-7) to assess anxiety, Patient Health Questionnaire 9-item to assess depression, Patient-Reported Outcomes Information System (PROMIS) Sleep Disturbance Scale to assess sleep quality, and Dermatology Life Quality Index (DLQI) to assess impact of skin disease on quality of life. Both minor and adult participants completed the same validated instruments; however, minors were excluded from analysis of GAD-7, PHQ-9, PROMIS Sleep Disturbance Scale, and DLQI as these instruments have been primarily validated in adult populations. The (PROMIS) Sleep Disturbance Scale, DLQI, and Hunger Vital Sign™ have not been validated in the Kenyan population; however, given the lack of equivalent available validated instruments, we felt the benefit of collecting this data outweighed the potential limitations. To compare GAD-7, PHQ-9, PROMIS, and DLQI between cases and controls, we performed multivariate regression adjusting for age and sex.

The provider enrollment questionnaire was completed by the study physician at MTRH at the time of subject enrollment, also as a REDCap form (Table 1). Validated instruments included the following: Psoriasis Area and Severity Index (PASI), Body Surface Area (BSA) affected, and Investigators Global Assessment (IGA).

RESULTS

As of July 2025, 214 subjects were enrolled in the KPR. Demographic characteristics of 106 healthy controls (HC) and 108 patients with PsO are summarized in Table 2. Both HC and PsO cohorts were predominantly female. The mean age of HCs was 33.8 years (SD 9.6). The mean age of the PsO cohort was 42.7 years (SD 17.1).

PsO clinical history is summarized in Table 3. The mean age of disease onset was 30.4 years (SD 16.5), with a mean age of diagnosis of 38.9 years (SD 17.5). A known family history of PsO was reported by 13.9% of patients with PsO; 9.3% of patients had a physician diagnosis of psoriatic arthritis, and 8.3% of patients were found to be PEST positive, scoring 3 or higher. Plaque PsO was the most common subtype (85.2%), and 7.4% of patients have had a current or past history

Table 1 Clinical, biosample, and physical exam assessments in the Kenyan Psoriasis Registry

Patient survey	Frequency
• Demographics, alcohol, smoking	Baseline
• Past medical history & psoriasis history	Baseline
• Family history	Baseline
• Health insurance and employment	Baseline
• Hunger Vital Sign™* (food insecurity screener)	Baseline
• Gender	Baseline
• Current medications	Baseline, yearly thereafter
• Comorbidities	Baseline, yearly thereafter
• Psoriasis medications and response	Baseline, yearly thereafter
• PEST (Psoriasis Epidemiology Screening Tool)*	Baseline, yearly thereafter
• Itch and Pain Numerical scale*	Baseline, yearly thereafter
• Generalized Anxiety Disorder 7-item (GAD-7)*	Baseline, yearly thereafter
• Dermatology Life Quality Index (DLQI)*	Baseline, yearly thereafter
• Patient Health Questionnaire 9 for Depression (PHQ-9)*	Baseline, yearly thereafter
• Patient-Reported Outcomes Information System (PROMIS) Sleep Disturbance Scale*	Baseline, yearly thereafter
Biosamples	
• Saliva (for DNA)	Baseline
Provider survey and physical exam	
• Height, weight, blood pressure	Baseline, yearly thereafter
• Psoriasis subtype(s) and anatomical areas affected	Baseline, yearly thereafter
• PASI (Psoriasis Area and Severity Index)*	Baseline, yearly thereafter
• BSA (Body Surface Area) affected*	Baseline, yearly thereafter
• IGA (Investigators Global Assessment)*	Baseline, yearly thereafter

*Indicates tool or survey instrument has been validated

of guttate PsO. Additionally, 4.6% have a history of erythrodermic PsO. The mean PASI score was 9.9 (SD 9.1), and mean IGA score was 3.0 (SD 1.0) (Supplemental Table 2). Areas of the body affected varied, with the extremities being the most common site (Table 3). In terms of treatment history, 96.3% of patients have used some type of moisturizer, 88.9% have tried calcipotriene/betamethasone, 75.9% have tried methotrexate, 9.3% have used biologic medications, and 7.4% have used phototherapy (Fig. 1).

Finally, sleep disturbance, quality of life, and mental health survey scores are summarized in Fig. 2. The mean PROMIS sleep scale T-score, DLQI, GAD-7, and PHQ-9 were assessed with the PsO cohort scoring significantly worse on all measures (Fig. 2).

Table 2 Demographics of Kenyan Psoriasis Registry

	Healthy controls (*n* = 106)	**Psoriasis (*n* = 108)**
Mean (SD) age	33.8 (9.6) years*	42.7 (17.1) years*
Age range	17–66 years	5–85 years
< 18	1	11
18–30	44	15
31–40	38	22
41–50	16	28
51–60	6	16
61–70	1	8
71–80	0	6
80+	0	2
% Female	64.2%	62%
Race/ethnicity		
East African/ Kenyan	100%	100%
East African/Kenyan Sub-ethnicity		
Kikuyu	13.2%	13%
Luhya	13.2%	9.3%
Kalenjin	55.7%	69.4%
Luo	7.5%	3.7%
Kisii	3.8%	0%
Other	6.6%	4.6%
Highest level of education		
No formal education	0%	1.9%
Primary school	0%	24.1%
Secondary school	17%	31.5%
College	45.3%	18.5%
University or above	37.7%	24.1%
Food insecure	61.3%	58.3%
Gender		
Woman	64.2%	61.1%
Man	35.8%	38.9%
Smoking history		
Smoker	0.9%	1.9%

Table 2 continued

	Healthy controls ($n = 106$)	Psoriasis ($n = 108$)
Former smoker	1.9%	5.6%
Never smoker	97.2%	92.6%
Over 100 cigarettes in lifetime	66.7%	37.5%
Use of alcohol in past year	11.3%	13.9%
Average number of drinks per week if yes	2.25	1.67
Medical comorbidities		
Chronic bronchitis	0%	0.9%
Hypertension	6.6%	7.4%
Peptic ulcer disease	0.9%	4.6%
Type II diabetes mellitus	0.9%	5.6%
HIV infection	0%	3.7%
Glaucoma	0%	0.9%
Epilepsy	0%	0.9%
Atopic dermatitis	1.9%	0%
Non-inflammatory arthritis	0.9%	0%

*Indicates significant difference at $p < 0.05$

DISCUSSION

The findings of this initial KPR cohort provide valuable insight into the demographics, clinical profile, quality of life, and mental health patients with PsO in Kenya. Healthy controls and PsO were similar in most demographics, except for a significant difference in age at time of enrollment. Interestingly, both healthy controls and PsO had a high rate of food insecurity (Table 2). We used the Hunger Vital Sign™ to assess food insecurity, which is a two-question screener that has been validated for both adults and children in the USA [10]. According to this screener, food insecurity was estimated to be present in 14.2% of US households on the basis of the 2013 Current Population Study [10], while 58.3% of patients with PsO and 61.3% of healthy controls in the KPR screened positive for food insecurity. This difference is likely multifactorial; this screening tool has not been validated in Kenya, and there are differences in the food infrastructure and availability in Kenya [11]. Tools such as the Food Insecurity Experience Scale (FIES) have been validated in sub-Saharan Africa, and could be considered for future studies [12].

Surprisingly, few patients reported medical comorbidities (Supplemental Table 1). There could be underreporting, as evidenced by the lower rate of reported hypertension compared to measured hypertension (Supplemental Tables 1 and 2). Potential reasons for underreporting include fear of stigma when disclosing medical history, uncertainty of one's own medical history, or unfamiliarity with terms presented in the registry surveys. Despite universal healthcare coverage in Kenya, access to public and private-for-profit healthcare facilities varies widely. Nationally, the average travel time to public and private healthcare facilities is 130 and 245 min, respectively [13]. It is possible that many KPR patients do not see medical providers frequently enough to be diagnosed with significant medical comorbidities. This may also

Table 3 Psoriasis clinical history

Psoriasis history	***N*** **= 108**
Mean (SD) age of onset	30.4 (16.5) years
Mean (SD) age of diagnosis	38.9 (17.2) years
Family history of psoriasis	13.9%
Diagnosis of psoriatic arthritis	9.3%
Mean (SD) age of diagnosis of psoriatic arthritis	54.6 (21.1)
Mean (SD) age of psoriatic arthritis symptom onset	50.9 (17.9)
Mean (SD) Itch numerical rating scale	4.2 (3.2)
Mean (SD) Pain numerical rating scale	2.1 (2.6)
% PEST positive (score 3 or above)	9%
Psoriasis morphology that patient has ever had	
Plaque	85.2%
Palmoplantar	6.5%
Pustular	1.9%
Guttate	7.4%
Genital	0.9%
Erythrodermic	4.6%
Inverse	0%
Psoriasis morphology that patient currently has	
Plaque	83.3%
Palmoplantar	6.5%
Pustular	0.9%
Guttate	7.4%
Genital	0.9%
Erythrodermic	0.9%
Inverse	0%
Psoriasis body locations (ever affected)	
Scalp	62.0%
Ears	38.0%
Face	36.1%
Trunk	63.0%
Extremities	87.0%

Table 3 continued

Psoriasis history	*N* = 108
Palms	23.1%
Nails	7.4%
Genitals	11.1%
Armpits, groin, skinfolds, gluteal fold	22.2%
Buttocks	34.3%
Soles of feet	19.4%

PEST Psoriasis Epidemiology Screening Tool

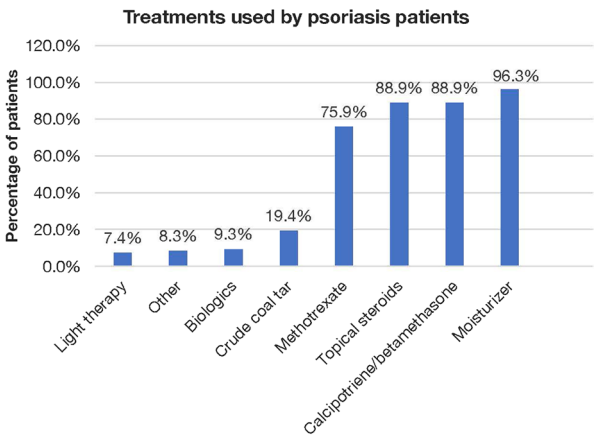


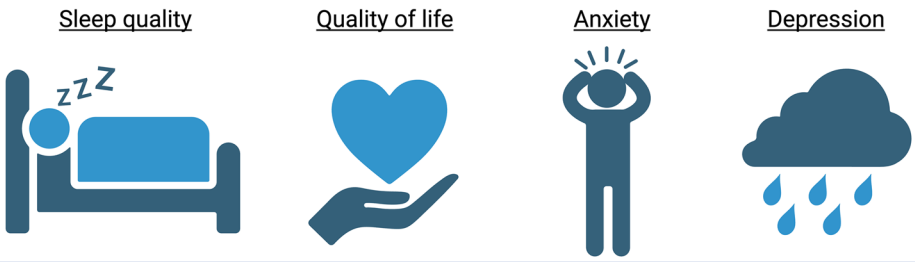
Fig. 1 Percentage of patients with PsO who have tried specific treatments

explain the low percentage of patients with PsO with a family history of PsO (Table 3). Estimates on the percentage of patients with PsO with a family history of PsO range from 10.8% [14] to 31.9% [15] to 36% [16] in Japan, Canada, and the USA, respectively. Additionally, diagnosis of psoriatic arthritis was reported by only 9.3% of patients with PsO (Table 3), but psoriatic arthritis typically affects up to 30% of patients with PsO at some point in their lifetime [17]. Mean age of psoriatic arthritis symptom onset was 50.9 years (SD 17.9), with mean age of diagnosis of 54.6 years (SD 21.1) (Table 3), which is aligned with the average diagnostic delay of psoriatic arthritis of up to 7 years [18].

Plaque PsO was the most common subtype that patients reported ever having (Table 3). Guttate PsO was reported in 7.4% of patients with PsO, making it slightly more common in this cohort compared to previous reports that estimate its prevalence to be 5% of all PsO [19]. Furthermore, a history of erythrodermic PsO was reported by 4.6% of patients, compared to 1–2.25% of PsO previously reported [20]. Finally, genital PsO was reported by just one participant, and inverse PsO was not reported by any participant. Given inverse and genital PsO affects about 21% of patients with PsO [21], this likely represents underreporting due to unfamiliar medical terminology, or anticipated and perceived stigma amongst patients with inverse and genital PsO [22]. Notably, 19.4% of patients with PsO in this study reported armpits, groin, skinfold, or gluteal fold involvement, and 11.1% reported genital involvement at some point in their PsO history (Table 3).

PsO severity was assessed using PASI and IGA scores. Mean PASI score was 9.93 (SD 9.1), indicating moderate disease activity [23]. The mean IGA score was 2.99 (SD 1.0), indicating mild to moderate disease. For comparison, a PsO registry study conducted in the UK found that most patients with PsO had mild or moderate disease [24].

In terms of treatment history, most patients have tried moisturizer or specialty topical medication (Fig. 1). Only 9.3% of patients with PsO have tried biologic medications, compared to a US study where 37.2% of patients with moderate to severe PsO receiving treatment were on biologics [6]. Of note, biologic medications for PsO are not currently on the Kenya Essential Medicines List, which is a comprehensive list of essential medication information that helps



	PROMIs sleep scale (mean T score (SD))	DLQI (mean (SD))	GAD-7 (mean (SD))	PHQ-9 (mean (SD))
Healthy Controls (n=105)	34.6** (9.0)	0.04** (0.2)	1.2** (2.3)	2.1** (3.3)
PsO (n=97)	41.28** (13.0)	7.5** (6.9)	3.1** (3.7)	4.8** (4.9)
Estimate, B (95% CI)	5.98 (2.55-9.41)	8.22 (6.77-9.67)	2.47 (1.54-3.4)	3.13 (1.85-4.41)

Fig. 2 Patient-Reported Outcomes Measurement Information System (PROMIS) Sleep Disturbance Scale, Dermatology Life Quality Index (DLQI), Generalized Anxiety Disorder-7 (GAD-7), and Patient Health Questionnaire-9 (PHQ-9) mean scores. Multivariate linear regression adjusting for age and sex was used to assess the effect of psoriasis on mental health outcomes. **Significant difference at $p < 0.001$. Created using BioRender.com

guide their procurement in the public sector [25]. Additionally, biologics for PsO are expensive, with cost ranging from $1664 for biosimilar versions of infliximab to $79,277 for risankizumab [26]. Of the Kenyan population, 36.1% lives on less than $2.15 per day [27], greatly limiting access to these costly medications. Older topical and systemic treatments are still utilized in Kenya, with crude coal tar treatment being reported by 19.4% of patients with PsO, although it is rarely still used in the USA [28]. Crude coal tar treatment a fairly inexpensive yet highly effective treatment for plaque PsO, making it a feasible option for this patient population [28]. Methotrexate usage was reported by 75.9% of patients with PsO, making it one of the most common treatments (Fig. 1). In a US patient registry, non-biologic systemic medications including methotrexate were received by approximately 13% of patients with PsO [29], and 11.7% of patients with PsO in a Belgium registry received methotrexate [30]. The percentage of patients with PsO in the KPR who have ever received methotrexate is substantially greater in comparison, perhaps owing to its relatively low cost [31].

The sleep, quality of life, and mental health patient-reported outcomes provided valuable insight into the experience of living with PsO in Kenya (Fig. 2). Patients with PsO scored one standard deviation below the mean for the PROMIS Sleep Disturbance instrument, meaning on average they reported less sleep disturbance than the mean used to validate this instrument [32]. However, patients with PsO scored about one standard deviation above healthy controls, meaning they do have reported worse sleep compared to patients without PsO. This instrument has not been validated in a Kenyan population, perhaps explaining why both PsO and healthy controls appear to have better sleep than average. Importantly, patients with PsO still had worse sleep compared to healthy controls. On average, skin disease had a moderate effect on quality of life for patients with PsO, compared to no effect for healthy controls, as measured

by the Dermatology Life Quality Index. Generalized Anxiety Disorder-7 (GAD-7) and Patient Health Questionnaire-9 (PHQ-9) scores were also significantly different between PsO and healthy controls, indicating worse mental health amongst patients with PsO. A GAD-7 score of 3.1 for patients with PsO represents minimal anxiety [33], while a PHQ-9 score of 4.8 for patients with PsO represents mild depression [34]. Importantly, both PHQ-9 and GAD-7 have previously been validated in Kenya [35–37]. These results indicate there is a significant mental health and quality of life impact of PsO in this Kenyan patient population.

There are several limitations to this study. First, we relied on patient self-report for the majority of demographic information and clinical history, which may be subject to recall bias or error. Despite obtaining informed consent and maintaining privacy, it is possible some patients did not feel comfortable disclosing some information to the study team. Additionally, as previously mentioned, it is possible some patients did not know some of their own or family medical history. One limitation of the study was the broad age range of the PsO cohort compared to the healthy control cohort. There was a statistical difference in mean age of the two groups. However, multivariate analysis adjusted for age when assessing the effect of psoriasis on mental health outcomes, and minors were excluded from this analysis. Another limitation of the study was the single-center design. Subjects were recruited exclusively from MTRH, limiting the generalizability of the findings to this patient population. Of note, MTRH is a national referral hospital and serves about 24 million people from Western Kenya and neighboring countries. Finally, we relied on three validated instruments (PROMIS Sleep Disturbance Scale, DLQI, and Hunger Vital Score™) that have not been validated in the Kenyan population, potentially limiting the generalizability of our findings. While there were no available validated tools equivalent to PROMIS Sleep Disturbance Scale or DLQI, the Food Insecurity Experience Scale (FIES), which has been validated in sub-Saharan Africa, could be considered for future studies in place of the Hunger Vital score [12]. Despite these limitations, our results provide much needed information on PsO in Kenya.

CONCLUSION

The KPR is the first psoriasis patient registry in Kenya to date. The findings from the first 214 subjects enrolled at MTRH in Eldoret, Kenya reveal important information on the demographic, clinical, and mental health profile of patients living with PsO in Kenya, filling an important knowledge gap. Our data indicates that patients with PsO in Kenya have overall worse sleep, and quality of life, and mental health compared to healthy controls. Additionally, we have gained valuable insight into the clinical history and treatments of patients with PsO in this population, with a lack of access to biologic medications being highlighted. Furthermore, this registry is continuing enrollment and yearly patient follow-up into the future, which will continue adding to our knowledge. Future studies will investigate factors associated with psoriasis severity and mental health outcomes. We will also investigate the genetic profile of PsO in Kenya by performing DNA genotyping from saliva samples collected at enrollment. Overall, the KPR is an exciting and ongoing source of information in this understudied population, and we hope its findings will contribute to further research and advocacy on psoriasis in Kenya.

ACKNOWLEDGEMENTS

We thank the participants of the study.
Figure 2 was created in BioRender.com. Where tools have been used for the creation of figures/images/tables/other material in the submission, the appropriate licenses/permissions have been obtained to allow publication in this journal and to permit reuse of the article, in whole or in parts, for all purposes, including any commercial reuse.

Author Contributions. Georgia Marquez-Grap, Petronilla Biwott, Gian Carol Baldonado, Andrea Leung, Allison Kranyak, Isabel Muraguri, Toby Maurer, Wilson Liao, and Samson Kiprono contributed to the study conception and design. Subject enrollment and data collection was conducted by Petronilla Letting. Initial data analysis and first draft of the manuscript was written by Georgia Marquez-Grap and all authors commented on previous versions of the manuscript. Miranda Chen, Gian Carlo Baldonado, and Andrea Leung completed further data analysis. All authors read and approved the final manuscript.

Funding. This study was funded by the National Psoriasis Foundation Discovery Grant. No funding or sponsorship was received for the publication of this article.

Data Availability. The datasets generated during and/or analyzed during the current study are available. From the corresponding author on reasonable request.

Declarations

Conflict of Interest. Wilson Liao has received research grant funding from Amgen, Janssen, Leo, and Regeneron. Wilson Liao is an Editorial Board member of *Dermatology and Therapy*. Wilson Liao was not involved in the selection of peer reviewers for the manuscript nor any of the subsequent editorial decisions. Georgia Marquez-Grap, Petronilla Biwott, Miranda Chen, Gian Carol Baldonado, Andrea Leung, Allison Kranyak, Isabel Muraguri, Toby Maurer, and Samson Kiprono have no disclosures to share.

Ethical Approval. This single-center observational study was approved by the Moi Teaching and Referral Hospital Institutional Research and Ethics Committee (Approval number 0004848) and University of California, San Francisco (UCSF) Institutional Review Board (IRB # 24-42250). Informed consent was obtained from the participants and their parent/guardian in the event of a minor's participation. This study was performed in accordance with the Helsinki Declaration of 1964, and its later amendments.

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