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ORIGINAL RESEARCH

Distribution and Predictors of Skin Diseases in a Multicenter Clinic-Based Cohort Across Four Regions of India

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Background: Comprehensive multicenter data on the distribution and determinants of skin diseases in India remain limited. We aimed to characterize the burden of dermatological conditions and identify demographic, behavioral, and clinical predictors across four geographic regions.

Methods: A retrospective, observational, multicentric, clinic-based, non-interventional study. About 6169 (including 422 children aged 1–16 years) Patients data were collected from 415 dermatologists databases attending dermatology clinics across the North, South, East, and West regions of India between June and September 2024. Data was collected using standardized case report forms. Skin diseases were classified into seven major categories: fungal, bacterial, viral, parasitic, autoimmune, inflammatory, and allergic; each defined using uniform diagnostic criteria. Logistic regression models identified independent predictors of each disease category.

Results: Fungal infections were the most common diagnosis (26.1%), followed by autoimmune (19.4%), inflammatory skin disease (18.4%) and allergic conditions (10.2%). Male sex was associated with higher odds of parasitic (aOR 1.84, 95% CI 1.39–2.45; $p < 0.001$), bacterial (aOR 1.43, 95% CI 1.15–1.79; $p < 0.01$), viral (aOR 1.35, 95% CI 1.10–1.67; $p < 0.01$), and fungal dermatoses (aOR 1.36, 95% CI 1.19–1.55; $p < 0.001$), and lower odds of inflammatory disease (aOR 0.69, 95% CI 0.60–0.80; $p < 0.001$). Low income was associated with increased odds of fungal (aOR 1.55, 95% CI 1.20–2.03; $p < 0.001$), bacterial (aOR 1.74, 95% CI 1.15–2.69; $p < 0.05$), and viral diseases (aOR 1.60, 95% CI 1.07–2.44; $p < 0.05$), and lower odds of autoimmune disease (aOR 0.69, 95% CI 0.52–0.92; $p < 0.01$). Regional differences were observed relative to the East region: inflammatory disease was less frequent in the North (aOR 0.56, 95% CI 0.42–0.76; $p < 0.001$), while viral disease was more frequent in North, South, and West regions (aORs approximately 2.0–2.7). Allergic disease was more common in the South (aOR 2.06, 95% CI 1.42–3.10; $p < 0.001$). Older age was modestly associated with autoimmune, allergic, bacterial, and viral disease, while children had a higher burden of parasitic infections.

Conclusion: In this large clinic-based study of dermatology patients across India, fungal infections were the most frequent diagnosis and disease patterns varied by sex, income, age, and region. These findings highlight substantial sociodemographic and geographic differences among patients seeking dermatologic care and support the need for region-specific prevention and management strategies in clinical practice.

Keywords: dermatological diseases, India, clinic-based cohort, epidemiology, skin disease distribution, multicenter study

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Introduction

Skin diseases impose a substantial burden on global health, affecting individuals across all age groups and socioeconomic strata. In India, a combination of climatic factors, wide socioeconomic disparities, and fragmented healthcare infrastructure has constrained efforts to understand the true distribution and determinants of common dermatoses. Accurate, multicenter data collection is essential to identify high-risk populations, characterize disease patterns, and guide targeted prevention and treatment strategies in diverse settings.

India's four geographic zones differ substantially in climate, population density, and healthcare access. The North (including states such as Delhi, Uttar Pradesh, Punjab, Haryana, and Bihar) is characterized by a continental climate with extreme summer heat; the South (Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Telangana) experiences year-round heat and humidity; the West (Gujarat, Maharashtra, Madhya Pradesh, Rajasthan) includes both arid and tropical zones; and the East (West Bengal, Odisha, Assam, and northeastern states) is marked by high humidity and monsoon rainfall. These regional differences in temperature, humidity, and socioeconomic conditions plausibly drive distinct patterns of skin disease, yet comparative multicenter data linking geography to dermatological burden remain scarce.

The seven broad skin disease categories examined in this study encompass: (1) fungal infections (eg., tinea corporis, tinea cruris, tinea pedis, onychomycosis, candidiasis, pityriasis versicolor); (2) bacterial infections (eg., impetigo, folliculitis, furuncle, cellulitis, erysipelas); (3) viral infections (eg., herpes zoster, warts, molluscum contagiosum, chickenpox); (4) parasitic infestations (eg., scabies, pediculosis); (5) autoimmune and immune-mediated conditions (eg., psoriasis, vitiligo, pemphigus vulgaris, lichen planus, alopecia areata, connective tissue disorders); (6) inflammatory dermatoses (eg., acne, atopic dermatitis, seborrheic dermatitis, rosacea, pityriasis rosea); and (7) allergic skin diseases (eg., allergic contact dermatitis, urticaria, eczema, drug-induced rashes). Cutaneous neoplasms were not included in the present analysis, as the study was conducted in general dermatology outpatient settings where malignant skin conditions are infrequently diagnosed and were not captured in the standardized case report form (Supplementary File).

Despite the availability of large clinical databases, inconsistent recording methods and missing values often prevent meaningful analysis. In the present study, we addressed these challenges by collecting standardized data from over 6000 patients (children and adults) across four regions of India, applying uniform definitions for skin disease categories, comorbidities, and demographic variables. This approach enabled us to examine the distribution of the seven major skin disease groups and to explore associations with age, gender, lifestyle factors, comorbid conditions, socioeconomic status, and geographic region.

The present analysis aims to provide a clear overview of the distribution of skin diseases among dermatology clinic attendees and to identify key demographic, behavioral, and clinical predictors within this clinic-based Indian cohort.

Material and Methods

Study Design and Population

A retrospective, multicentric, clinic-based analysis of patients from the India Skin Study, which enrolled 6,169 patients (including 422 children aged 1–16 years) who attended dermatology outpatient clinics across four geographic regions of India (North, South, East, West) between June 2024 and September 2024. A total of 415 dermatologists participated; each physician was asked to consecutively enroll all eligible patients during the study period, up to a maximum of approximately 15 patients per physician. Repeat visits by the same patient and duplicate records were excluded. Data was collected by participating dermatologists using standardized site-specific case report forms and were subsequently unified into a central database (Figure 1).

The four geographic regions were defined as North: Bihar, Chandigarh, Delhi, Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Uttar Pradesh, Uttarakhand; South: Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Telangana; West: Chhattisgarh, Goa, Gujarat, Madhya Pradesh, Maharashtra, Rajasthan; East: Assam, Arunachal Pradesh, Jharkhand, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Sikkim, Tripura, West Bengal.

The study protocol was approved by the Medilink Ethics Committee at Medilink Hospital Research Centre, Ahmedabad, Gujarat, India. As this was a retrospective and observational study, the Ethics Committee granted

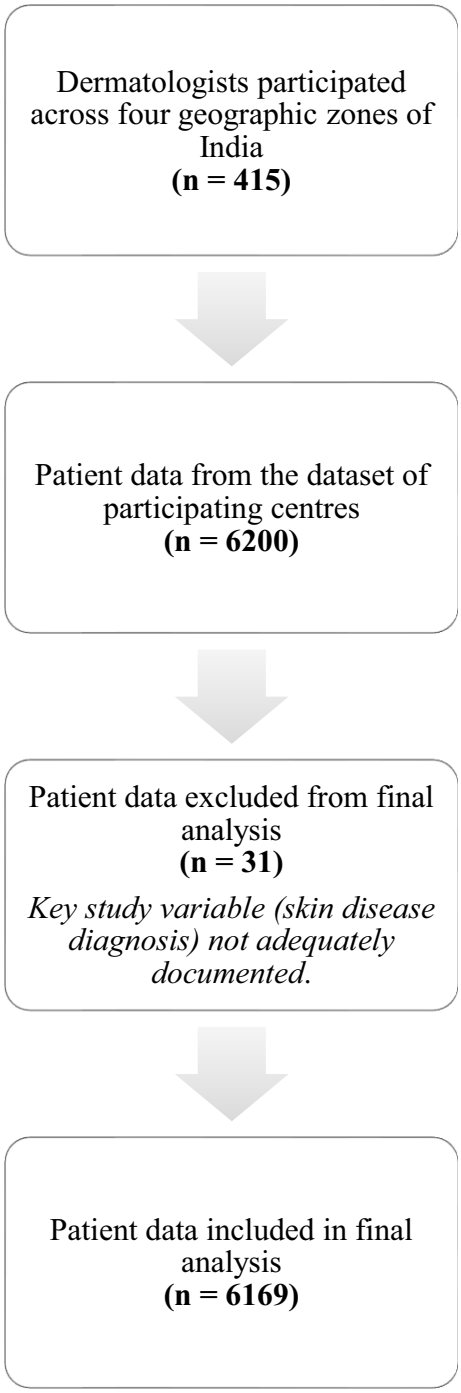

Figure 1 STROBE diagram (Flow of the Participants).

a waiver for obtaining informed consent from participants. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Data Collection and Variable Definitions

Demographic information (age, sex, height in cm, weight in kg, income status), lifestyle factors (smoking status, tobacco use, alcohol consumption and dietary habit) and clinical variables (type of skin disease, comorbidities, treatment status) were recorded using standardized case report forms. Height values outside the plausible range of 100–220 cm were

flagged as likely data-entry errors (eg., height recorded in meters rather than centimeters) and excluded from BMI calculations; BMI was defined as weight (kg) divided by height (m^2). Income status was categorized by self-report as low, middle, or high; no standardized income cutoffs were applied, and this limitation is acknowledged. Smoking was recorded as smoker versus non-smoker (no distinction between current and former smokers was captured in the case report form). Alcohol consumption was categorized as non-alcoholic, infrequent (occasional use), or regular (frequent use); quantitative thresholds (units per week) were not recorded. Tobacco use was recorded as a categorical variable (yes/no) based on chewing habits, and the quantity or frequency of tobacco consumption was not documented in the case report form (CRF). Dietary habits were classified as vegetarian or non-vegetarian.

Skin diseases were classified at two hierarchical levels:

1. Disease category (seven major groups): fungal, bacterial, viral, parasitic, autoimmune/immune-mediated, inflammatory, and allergic, defined using uniform diagnostic criteria. A separate pigmentary category (melasma, vitiligo, acanthosis nigricans, hyperpigmentation, and related conditions) and "other" category was recorded descriptively but not included in the main regression analyses owing to heterogeneity.
2. Specific skin condition: the clinical diagnosis within that category, such as tinea corporis, tinea cruris, tinea pedis, onychomycosis, impetigo, furuncle, folliculitis, herpes zoster, warts, scabies, psoriasis, alopecia areata, vitiligo, acne, seborrheic dermatitis, melasma, atopic dermatitis, allergic contact dermatitis, hives, eczema, and other conditions not falling into these groups.

Several conditions may overlap categories; in such cases, the primary clinical diagnosis as recorded by the treating dermatologist determined classification. For example, psoriasis and vitiligo were classified as autoimmune; eczema and hives as allergic; acne, atopic dermatitis and seborrheic dermatitis as inflammatory. Each patient could present with up to four concurrent disease categories and four specific diagnoses. This dual-level approach enabled analysis both at the broad category level and at the level of individual clinical diagnoses.

Statistical Analysis

All analyses were performed in R (version 4.3). Continuous variables are presented as mean ± SD and compared across groups by one-way ANOVA. Categorical variables are summarized as counts and percentages and compared by Pearson's chi-square test. Summary tables were generated for patient characteristics stratified by gender, age group (children [1–16 years] vs. adolescents/adults [≥17 years]), and geographic region.

Missing Data

The proportion of missing values was assessed for all key covariates prior to modeling. Complete-case analysis was applied, excluding records with missing values on any model covariate (age, BMI, smoking, alcohol, dietary habit, income status, hypertension, T2DM). Number of missing data was reported in the results. Complete-case analysis was chosen because characteristics of complete and incomplete cases were similar.

Multivariable Modelling

To identify independent predictors of each skin disease category, seven separate logistic regression models were fitted, one for each outcome (fungal, autoimmune, inflammatory, allergic, bacterial, viral, parasitic; each coded Yes vs No). Pigmentary and "other" categories were excluded from regression modelling but are shown descriptively. Covariates included age (years), sex (male vs. female), BMI (kg/m^2), smoking (smoker vs. non-smoker), alcohol use (non-alcoholic, infrequent, regular), dietary habit (non-vegetarian vs. vegetarian), income status (low, middle, high), hypertension (yes/no), and T2DM (yes/no). Results are reported as adjusted odds ratios (ORs) with 95% confidence intervals (CIs) and p-values. Note that because the data were collected from hundreds of dermatologists across multiple sites and the case report forms did not systematically record physician or clinic identifiers in a form suitable for multilevel modelling, site-level clustering was not formally accounted for in the regression models; this is acknowledged as a limitation.

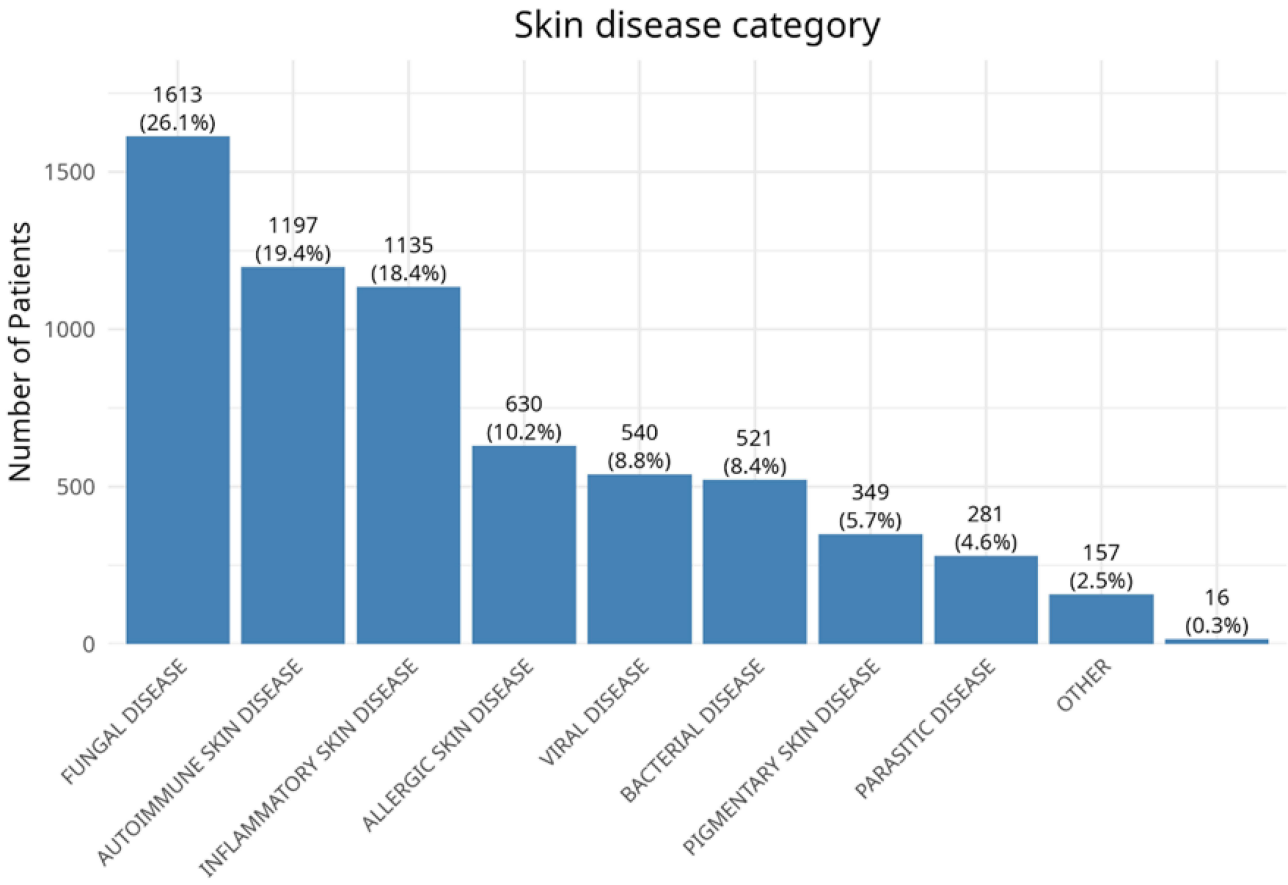

Figure 2 Skin Disease Category.

Results

The distribution of skin disease categories among 6,169 clinic attendees is shown in Figure 2. Fungal diseases were the most common, present in 26.1% of patients, followed by autoimmune skin diseases (19.4%) and allergic skin diseases (10.2%). Inflammatory skin diseases accounted for 18.4%, viral for 8.8%, and bacterial for 8.4%. Pigmentary skin diseases represented 5.7% and parasitic diseases 4.6%.

Most patients (95.9%) were diagnosed with a single broad disease category (fungal, autoimmune, etc). A smaller proportion (3.9%) presented with two concurrent disease categories, while only 0.2% had three disease categories simultaneously. Note that these figures refer to broad disease categories; data on the distribution of the number of specific clinical diagnoses per patient (eg., two different fungal species or an additional inflammatory condition) are reported separately below and in Supplementary Figure 1.

The prevalence of specific skin conditions within each category, including conditions with at least 100 patients, is shown in Figure 3. Tinea corporis/Tinea cruris were most frequent (23%) {tinea corporis (12%) and tinea cruris (11%)}, followed by psoriasis (13%) acne (9%), alopecia areata (8%), eczema (6%), melasma (6%), and vitiligo (5%). All other conditions each accounted for less than 5% of cases.

At the level of specific clinical diagnoses (eg., tinea corporis, psoriasis, atopic dermatitis), many patients (77.6%) presented with a single specific skin condition. Approximately one in five patients (20.5%) had two concurrent specific diagnoses (which could be within the same or different disease categories). Only 1.7% had three co-existing specific conditions, and very few (0.2%) had four (Supplementary Figure 1). This is distinct from the category-level analysis above (95.9% single category), which counts broad disease groups rather than individual diagnoses. Supplementary Figure 2 shows a breakdown of specific skin conditions within each broad disease category.

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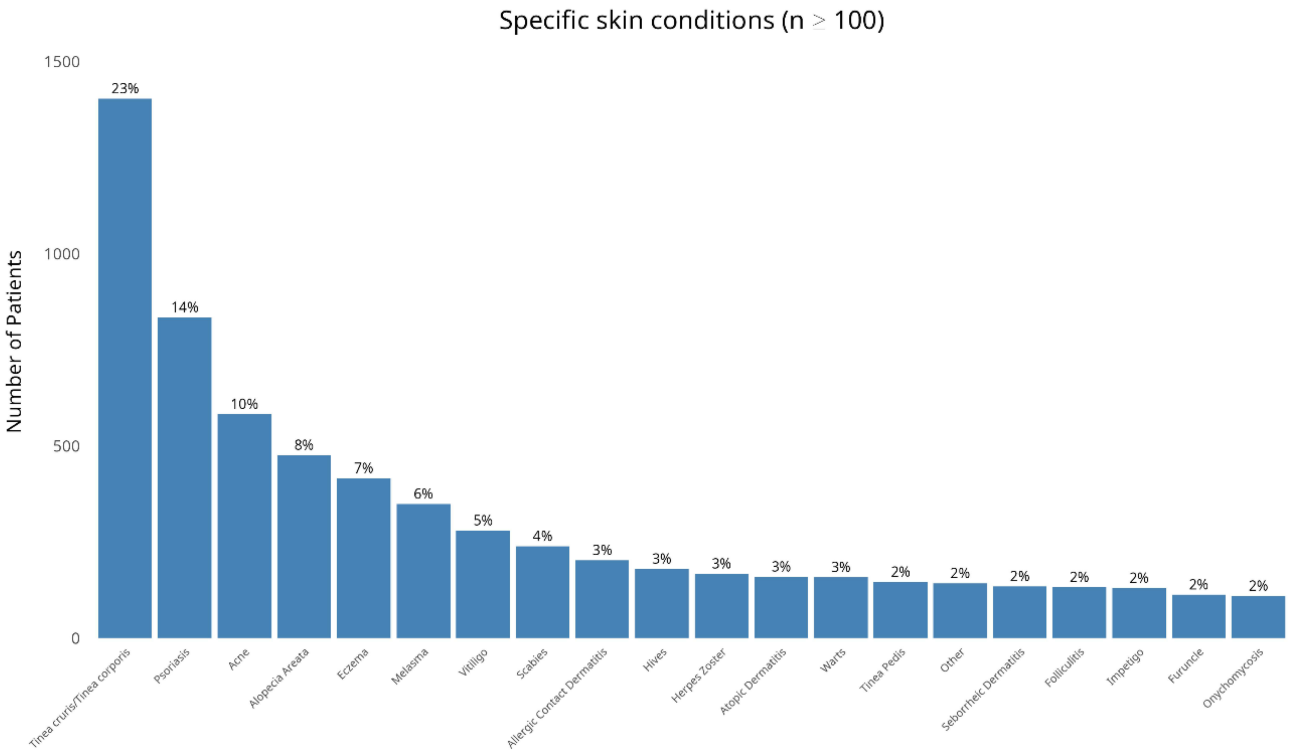

Figure 3 Specific Skin Condition (n ≥ 100).

Table 1 shows that the study included 6169 patients (2,886 women and 3,283 men) with a mean age of 35.6 ± 14.5 years and a mean BMI of 23.6 ± 5.3 kg/m^2. Most participants were non-vegetarian (68.9%) and belonged to the middle-income group (73.4%). Hypertension (5.6%), type 2 diabetes (5.4%), regular alcohol use (4.5%), smoking (12.7%), and

Table 1 Patient Characteristics by Gender

	Female (N=2886)	Male (N=3283)	Total (N=6169)	p value
Age [yrs]	34.5 (14.1)	36.6 (14.7)	35.6 (14.5)	<0.001
Height [cm]	158.7 (12.0)	164.8 (12.7)	162.0 (12.8)	<0.001
Weight [kg]	58.3 (12.3)	66.0 (14.6)	62.4 (14.1)	<0.001
BMI (kg/m^2)	23.2 (4.8)	24.0 (5.6)	23.6 (5.3)	<0.001
Hypertension	154 (5.3%)	194 (5.9%)	348 (5.6%)	0.330
T2DM	151 (5.2%)	185 (5.6%)	336 (5.4%)	0.487
Smoking	62 (2.2%)	716 (21.9%)	778 (12.7%)	<0.001
Tobacco use	70 (2.4%)	397 (12.1%)	467 (7.6%)	<0.001
Alcohol consumption				<0.001
- NON-ALCOHOLIC	2619 (92.7%)	2090 (64.8%)	4709 (77.8%)	
- INFREQUENT	172 (6.1%)	899 (27.9%)	1071 (17.7%)	
- REGULAR	34 (1.2%)	238 (7.4%)	272 (4.5%)	

(*Continued*)

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Table 1 (Continued).

	Female (N=2886)	Male (N=3283)	Total (N=6169)	p value
Non-vegetarians	1843 (64.6%)	2376 (72.7%)	4219 (68.9%)	<0.001
Income status				0.210
- LOW	476 (17.3%)	499 (15.8%)	975 (16.5%)	
- MIDDLE	1995 (72.4%)	2354 (74.3%)	4349 (73.4%)	
- HIGH	286 (10.4%)	314 (9.9%)	600 (10.1%)	
On treatment	1141 (99.1%)	1264 (99.1%)	2405 (99.1%)	0.853
Disease recurrence	512 (98.7%)	586 (97.8%)	1098 (98.2%)	0.301
Treatment-resistant disease	220 (97.3%)	231 (94.7%)	451 (96.0%)	0.142

tobacco use (7.6%) were relatively uncommon. Height values outside the physiologically plausible range of 100–220 cm (likely entered in meters) were identified in 3852 records and excluded from BMI calculations. The proportion of missing values among key model covariates was low: age (0.2%), BMI (14.7%), income status (0%), alcohol use (0%), dietary habit (0%), and smoking (0%).

Women were on average younger (34.5 ± 14.1 vs. 36.6 ± 14.7 years) and had a lower BMI (23.2± 4.8 vs. 24 ± 5.6 kg/m^2) than men. Women were also significantly less likely to smoke (2.2% vs. 21.9%), use tobacco (2.4% vs. 12.1%), or drink alcohol regularly (1.2% vs. 7.4%). Rates of hypertension (5.3% vs. 5.9%) and type 2 diabetes (5.2% vs. 5.6%) were similar between women and men.

Table 2 shows that Parasitic skin diseases were significantly more frequent in children (1–16 years) than in adolescents and adults (13.7% vs. 3.7%, $p < 0.001$). Bacterial skin diseases were also more common in children than in adolescents and adults (10.4% vs. 8.0%), although this difference did not reach statistical significance ($p = 0.080$). In contrast, fungal skin diseases (24.4% vs. 15.6%, $p < 0.001$) and pigmentary skin diseases (5.0% vs. 0.5%, $p < 0.001$) were significantly more common in adolescents and adults. The mean age of patients with fungal infections was 36.1 ± 13.5 years.

Table 3 presents adjusted odds ratios (aORs) for seven skin disease categories after inclusion of region in the multivariable models.

Male sex was associated with higher odds of fungal (aOR 1.36, 95% CI 1.19–1.55; $p < 0.001$), bacterial (aOR 1.43, 95% CI 1.15–1.79; $p < 0.01$), viral (aOR 1.35, 95% CI 1.10–1.67; $p < 0.01$), and parasitic disease (aOR 1.84, 95% CI 1.39–2.45; $p < 0.001$), and lower odds of inflammatory disease (aOR 0.69, 95% CI 0.60–0.80; $p < 0.001$). Age was positively associated with autoimmune (aOR 1.01, 95% CI 1.00–1.01; $p < 0.01$), bacterial (aOR 1.01, 95% CI 1.01–1.02; $p < 0.001$), and parasitic disease (aOR 0.98, 95% CI 0.97–0.99; $p < 0.001$), and inversely associated with inflammatory disease (aOR 0.98, 95% CI 0.97–0.98; $p < 0.001$); associations with allergic and viral disease were small (aORs approximately 1.01) and of borderline significance. Higher BMI was associated with slightly increased odds of fungal disease (aOR 1.01, 95% CI 1.00–1.02; $p < 0.05$) and lower odds of bacterial (aOR 0.98, 95% CI 0.96–1.00; $p < 0.05$) and viral disease (aOR 0.98, 95% CI 0.96–1.00; $p < 0.05$).

Regional differences were evident relative to East. North was associated with reduced odds of inflammatory disease (aOR 0.56, 95% CI 0.42–0.76; $p < 0.001$) and increased odds of viral disease (aOR 2.70, 95% CI 1.67–4.57; $p < 0.001$). South was associated with lower odds of fungal disease (aOR 0.76, 95% CI 0.61–0.95; $p < 0.05$) and higher odds of allergic (aOR 2.06, 95% CI 1.42–3.10; $p < 0.001$), bacterial (aOR 1.91, 95% CI 1.25–3.04; $p < 0.01$), and viral disease (aOR 2.00, 95% CI 1.27–3.31; $p < 0.01$). West was associated with lower odds of inflammatory disease (aOR 0.74, 95%

Table 2 Adjusted ORs for Seven Skin-Disease Categories Including Regions. Each Pair Shows OR (95% CI) and Significance Stars

Adjusted Odds Ratio (95% CI)							
Covariate	**Fungal**	**Autoimmune**	**Inflammatory**	**Allergic**	**Bacterial**	**Viral**	**Parasitic**
Age (years)	1.00 (1.00–1.01)	1.01 (1.00–1.01) **	0.98 (0.97–0.98) ***	1.01 (1.00–1.01)	1.01 (1.01–1.02) ***	1.01(1.00–1.01)	0.98 (0.97–0.99) ***
BMI (kg/m^2)	1.01 (1.00–1.02) *	1.01 (1.00–1.02)	0.99 (0.98–1.01)	1.00 (0.98–1.01)	0.98 (0.96–1.00) *	0.98 (0.96–1.00) *	1.00 (0.97–1.03)
Gender (male)	1.36 (1.19–1.55) ***	1.03 (0.89–1.20)	0.69 (0.60–0.80) ***	0.84 (0.69–1.02)	1.43 (1.15–1.79) **	1.35 (1.10–1.67) **	1.84 (1.39–2.45) ***
Region (North vs East)	0.96 (0.75–1.23)	0.93 (0.70–1.23)	0.56 (0.42–0.76) ***	1.37 (0.89–2.15)	1.35 (0.83–2.25)	2.70 (1.67–4.57) ***	1.25 (0.73–2.22)
Region (South vs East)	0.76 (0.61–0.95) *	0.85 (0.66–1.09)	0.81 (0.64–1.04)	2.06 (1.42–3.10) ***	1.91 (1.25–3.04) **	2.00 (1.27–3.31) **	1.07 (0.66–1.82)
Region (West vs East)	0.87 (0.69–1.10)	0.96 (0.74–1.25)	0.74 (0.57–0.96) *	1.49 (1.00–2.28)	1.85 (1.19–3.00) **	2.10 (1.32–3.52) **	1.03 (0.61–1.81)
Smoking (smoker)	1.09 (0.88–1.36)	1.10 (0.87–1.39)	1.22 (0.93–1.60)	1.11 (0.80–1.54)	0.70 (0.48–0.99)	0.78 (0.54–1.11)	0.85 (0.50–1.41)
Alcohol (non-alcoholic)	0.93 (0.77–1.12)	0.83 (0.68–1.02)	1.31 (1.03–1.66) *	1.09 (0.82–1.45)	0.85 (0.64–1.15)	1.00 (0.75–1.36)	1.63 (1.05–2.62) *
Alcohol (regular)	1.12 (0.81–1.54)	1.13 (0.80–1.59)	0.79 (0.49–1.22)	0.52 (0.27–0.93) *	1.31 (0.79–2.12)	1.19 (0.70–1.97)	0.88 (0.32–2.03)
Dietary habit (non-vegetarian)	1.22 (1.05–1.42) **	1.05 (0.90–1.24)	0.94 (0.80–1.11)	0.95 (0.78–1.18)	0.98 (0.78–1.24)	0.81 (0.65–1.01)	0.87 (0.65–1.18)
Income status (low)	1.55 (1.20–2.03) ***	0.69 (0.52–0.92) **	0.78 (0.59–1.04)	0.74 (0.53–1.05)	1.74 (1.15–2.69) *	1.60 (1.07–2.44) *	1.19 (0.70–2.11)
Income status (middle)	1.43 (1.15–1.81) **	0.88 (0.71–1.11)	0.78 (0.62–0.98) *	0.71 (0.54–0.94) *	1.38 (0.96–2.04)	1.31 (0.93–1.91)	1.03 (0.66–1.72)
Hypertension (yes)	0.72 (0.53–0.96) *	1.16 (0.86–1.55)	1.41 (1.01–1.93) *	1.06 (0.71–1.52)	0.67 (0.40–1.07)	1.15 (0.74–1.73)	1.29 (0.66–2.32)
Type 2 diabetes (yes)	0.96 (0.71–1.27)	0.95 (0.69–1.28)	0.92 (0.63–1.30)	1.22 (0.83–1.75)	0.98 (0.61–1.50)	0.98 (0.62–1.50)	1.03 (0.49–1.95)

Notes: *P < 0.05, **P < 0.01, ***P < 0.001. Models adjusted for age, sex, BMI, region, lifestyle factors, and comorbidities.

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Table 3 Difference Between Children (16 ≤ Years) and Adults

Skin Disease Category	Children (1–16) (N=422)	Adolescents/Adults (≥17) (N=5747)	Total (N=6169)	p value
Fungal skin disease	66 (15.6%)	1402 (24.4%)	1468 (23.8%)	< 0.001
Autoimmune skin disease	59 (14.0%)	1081 (18.8%)	1140 (18.5%)	0.014
Inflammatory skin disease	82 (19.4%)	858 (14.9%)	940 (15.2%)	0.013
Allergic skin disease	56 (13.3%)	862 (15.0%)	918 (14.9%)	0.335
Bacterial skin disease	44 (10.4%)	460 (8.0%)	504 (8.2%)	0.080
Viral skin disease	44 (10.4%)	473 (8.2%)	517 (8.4%)	0.116
Parasitic skin disease	58 (13.7%)	214 (3.7%)	272 (4.4%)	< 0.001
Pigmentary skin disease	2 (0.5%)	287 (5.0%)	289 (4.7%)	< 0.001
Other skin disease	9 (2.1%)	148 (2.6%)	157 (2.5%)	0.577

CI 0.57–0.96; $p < 0.05$) and higher odds of bacterial (aOR 1.85, 95% CI 1.19–3.00; $p < 0.01$) and viral disease (aOR 2.10, 95% CI 1.32–3.52; $p < 0.01$). Regional associations were not statistically significant for autoimmune or parasitic disease.

Among lifestyle and comorbidity covariates, smoking was associated with lower odds of bacterial disease (aOR 0.70, 95% CI 0.48–0.99; $p < 0.05$). Non-alcoholic status was associated with higher odds of inflammatory (aOR 1.31, 95% CI 1.03–1.66; $p < 0.05$) and parasitic disease (aOR 1.63, 95% CI 1.05–2.62; $p < 0.05$), while regular alcohol use was associated with lower odds of allergic disease (aOR 0.52, 95% CI 0.27–0.93; $p < 0.05$). A non-vegetarian diet was associated with higher odds of fungal disease (aOR 1.22, 95% CI 1.05–1.42; $p < 0.01$). Compared with high income, low income was associated with higher odds of fungal (aOR 1.55, 95% CI 1.20–2.03; $p < 0.001$), bacterial (aOR 1.74, 95% CI 1.15–2.69; $p < 0.05$), and viral disease (aOR 1.60, 95% CI 1.07–2.44; $p < 0.05$), and lower odds of autoimmune disease (aOR 0.69, 95% CI 0.52–0.92; $p < 0.01$). Type 2 diabetes was not significantly associated with any disease category.

Discussion

In this large multicentric clinic-based study of over 6,000 dermatology outpatients across India, we analyzed demographic, behavioral, and clinical patterns across seven broad skin disease categories, while also examining selected specific skin conditions to provide additional detail.

Fungal skin diseases were the most prevalent, affecting over a quarter of participants. Our findings are consistent with those reported by Sarac et al, where fungal infections (23.0%) were the most prominent condition.[1] These observations are also in line with previous Indian studies, which have reported prevalence rates ranging from 6.09% to 27.6% in South India and up to 61.5% in North India, largely based on hospital cohorts.[2] The high prevalence observed in our study likely reflects India's hot and humid climate, along with the widespread misuse of topical corticosteroids, which has contributed to a nationwide surge in chronic dermatophytosis over the past 5–7 years.

Autoimmune skin diseases ranked second in frequency (19.4), which is higher than commonly reported in outpatient populations. This figure likely reflects referral patterns in clinic-based sampling: autoimmune conditions such as vitiligo, psoriasis, and pemphigus vulgaris require long-term specialist care, confirmatory histopathology, or immunofluorescence testing, and thus preferentially accumulate in dermatology outpatient registers compared with their true community prevalence. The high burden may also reflect improved recognition and access to diagnostic tools in recent years.

Inflammatory skin diseases such as atopic dermatitis (AD) accounted for 13.4% of diagnoses and were more common in younger patients and females. Notably, allergic skin diseases (eg., urticaria, contact dermatitis) accounted for only 13.8%, ranking below autoimmune and fungal diseases, and were not among the top three disease categories. This

contrasts with data from Western countries, where allergic skin disease is often a leading cause of dermatologist visits. Regional and environmental differences, underreporting, or classification overlap may partly explain this divergence.

Gender and Sex and Infection Risk

In our study, male gender was significantly associated with higher odds of infectious skin diseases, including fungal, bacterial, viral, and parasitic infections. Sarac et al reported fungal infections 1.55 times more common in geriatric males (OR 1.55, 95% CI 1.134–2.132, P=0.006), with viral infections also prevalent (8.2% overall), though bacterial infections showed no gender difference (2.3% females vs. 2.7% males, P=0.655)—contrasting our bacterial findings.[1] Our study findings are consistent with other study who reported that male sex independently predicts a higher risk of infectious dermatoses, with 30–85% increased odds across categories.[3] This pattern is thought to result from a combination of biological factors, such as thicker, more sebaceous skin and differences in immune response, as well as behavioral and occupational exposures that increase contact with pathogens. In contrast, men in our cohort had significantly lower odds of inflammatory and allergic skin conditions. This finding is consistent with the study by West et al, which reported a higher prevalence of inflammatory skin diseases in females compared to males (odds ratio 1.58, 95% CI 1.26–1.99).[4] Our results also align with prior literature suggesting a greater burden of autoimmune and inflammatory dermatoses in women, potentially due to stronger immune responses, hormonal influences such as estrogen, and more frequent healthcare utilization.[3,5]

Age-Related Divergence

Age had opposite associations depending on disease type. Older individuals were slightly more likely to have autoimmune and bacterial skin diseases, but less likely to suffer from inflammatory and parasitic conditions. Similar age patterns have been observed elsewhere: immune-mediated diseases (eg. vitiligo, pemphigus) tend to peak in middle-aged adults, while scabies and inflammatory eczema are more common in younger people.[6] The declining risk of parasitic infestations with age likely reflects cumulative immunity, whereas the rising autoimmune risk may reflect age-related immune dysregulation.

Socioeconomic Gradient

Lower income status was strongly associated with higher odds of infectious skin diseases, in agreement with global studies linking poverty to scabies, impetigo, and fungal infections. Crowding, reduced access to clean water, and delayed treatment all contribute to this gradient.[7] Intriguingly, lower income was inversely associated with the odds of autoimmune skin diseases. Similar findings were reported by Chhabra et al, where autoimmune skin diseases were less prevalent in the lower socioeconomic group (28%).[8] This finding most likely reflects differential access to specialist care rather than a true biological relationship: autoimmune dermatoses (psoriasis, vitiligo, pemphigus vulgaris) require expert consultation, confirmatory investigations such as skin biopsy or direct immunofluorescence, and often expensive immunosuppressive treatments—resources that are less accessible in lower socioeconomic strata. Patients with limited income may not seek or reach a dermatologist for immune-mediated conditions, resulting in under-recognition in clinic-based cohorts. This pattern is consistent with the inverse care law, whereby those with the greatest disease burden have the least access to specialist services [**hart_inverse_1971**]. A similar under-diagnosis gradient has been described for psoriasis in low-income settings.[7]

Behavioral Factors

We observed only modest effects of smoking and BMI on skin disease risk, and mixed patterns for alcohol use. Unlike some Western cohorts where heavy smoking exacerbates psoriasis or acne (Armstrong), our smokers did not have significantly higher odds of inflammatory or allergic conditions. This may reflect cultural differences in smoking intensity or genetic susceptibility. However, recent Mendelian randomization data suggest a potential causal link between smoking and atopic dermatitis: Wang and Zhang analyzed large-scale GWAS datasets from the UK Biobank and BioBank Japan and found that ever-smoking was significantly associated with increased odds of atopic dermatitis (OR 1.159; 95% CI 1.040–1.292), supporting a possible direct effect of tobacco exposure on disease risk.[9] Regular alcohol consumption in our cohort was associated with lower odds of allergic diseases but higher odds of inflammatory and parasitic conditions —an intriguing and understudied pattern that may reflect immunomodulatory effects of alcohol and warrants further mechanistic investigation.

Regional Differences

This study showed that allergic skin diseases were more common in South India compared with the East, a finding consistent with previous reports linking year-round allergen exposure and higher diagnosis rates in the region.[10] This observation is further supported by the findings of Lim et al, who reported that elevated temperatures are significantly associated with an increased risk of eczema and other allergic skin diseases, with approximately a 9% increase in risk for every 1°C rise in temperature (OR = 1.09).[11] Bacterial skin diseases showed a higher prevalence in the South and West compared with the East, but not in the North.

Inflammatory skin diseases were less common in the North and South relative to the East, which aligns with earlier observations of reduced prevalence in cooler or drier climates such as those found in northern India.[10] In contrast, viral skin diseases were more common in all three other regions: North, South, and West compared with the East (Supplementary Tables 1 and 2).

No significant regional differences were observed for fungal, autoimmune, pigmentary, or parasitic skin diseases. These findings contrast with previous reports suggesting a higher prevalence of dermatophytosis in regions with elevated humidity and temperature, as noted by Lim et al.[11] Earlier studies from India have also reported a higher prevalence of fungal infections in the Eastern region, which is characterized by warm and humid climatic conditions compared with other regions, possibly due to higher humidity and the widespread use of steroid-containing creams that exacerbate dermatophytosis.[12] However, our adjusted analysis did not confirm this association, indicating that regional differences in fungal skin disease may be less pronounced after accounting for demographic and clinical factors.

Skin Conditions Related to Children vs Adults

Children (1–16 years) were more frequently affected by parasitic skin diseases than adults but had lower rates of fungal skin infections and pigmentary disorders. This finding is consistent with previous studies reporting a high prevalence of scabies among school-aged children.[13] For instance, Masawe et al reported scabies in 16.6% of children, with an overall prevalence of 10.08% among schoolchildren. Similarly, studies from India have reported variable prevalence rates, ranging from 6% in Kerala and 4% in Gujarat to approximately 8.2% in coastal Karnataka.[14] This pattern may reflect greater exposure to parasites through outdoor play, immature immune responses, and a higher likelihood of being brought to medical attention for visible or itchy symptoms such as scabies. In contrast, fungal and pigmentary conditions were more common in older individuals, likely due to hormonal changes, prolonged sun exposure, and the chronic nature of certain fungal infections.[15] This finding is supported by a study by Dlova et al, which reported that pigmentary disorders were more prevalent in adults (>18 years) (79.6%) compared to children (<18 years) (20.4%).[16]

Limitations

Several limitations of this study warrant consideration. First, the study population consists exclusively of dermatology clinic attendees; it is not a population-based or community sample. Patients who do not seek specialist care, particularly those in rural areas or lower socioeconomic strata, are not represented, limiting generalizability to the broader Indian population. Referral bias is therefore an important caveat when interpreting observed disease frequencies, particularly for conditions requiring specialist diagnosis (eg., autoimmune diseases). Second, data were collected over a four-month period (June–September 2024), which may introduce seasonal bias; for example, fungal and parasitic infections may be over-represented during the monsoon season. Third, due to the wide diversity, the regression models did not formally account for clustering by physician or clinic site; standard errors may therefore be underestimated, and readers should interpret confidence intervals with appropriate caution. Patients could present with multiple concurrent disease categories; while this was captured, potential correlation between outcome variables across the seven models was not formally adjusted for. Finally, the case report did not capture neoplastic skin conditions.

Conclusion

This large clinic-based study provides a detailed overview of the spectrum and distribution of skin diseases among patients attending dermatology services in India and highlights important demographic, behavioral, and geographic patterns. Fungal infections were the most frequent diagnoses, particularly among patients from humid regions, suggesting

a role for environmental exposure and treatment practices. Autoimmune and inflammatory dermatoses were also common, especially among older adults and women, while parasitic infections were more frequent in children. Socioeconomic status, gender, age, and region were each associated with disease risk in distinct ways.

These findings emphasize the need for targeted prevention and management strategies within dermatology care settings that consider local epidemiology, age-related vulnerability, and sociodemographic factors. Such approaches may improve early diagnosis, optimize treatment, and reduce the burden of skin disease among patients seeking dermatologic care in India.

Disclosure

Dr Willem Verberk reports fees from Eris Lifesciences Ltd, during the conduct of the study. The authors report no other conflicts of interest in this work.

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