Original Article

Discrepancies Between Disease Burden and Digital Search Interest in Dermatology: A Nationwide Google Trends Analysis from Türkiye

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Abstract

Aim: To examine the correspondence between the burden of dermatological diseases, measured by disability-adjusted life years (DALYs), and public interest reflected in Google Trends (GTs) search activity in Türkiye, to provide evidence-based contributions for the development of effective public health strategies.

Materials and Methods: DALY estimates for 14 dermatological conditions were obtained from the Global Burden of Disease 2021 database. GTs scores for both medical and lay terms, derived from the Turkish Dermatology Association's patient brochures, were retrieved from January 2021 to May 2025. Relative search volume (RSV) values were normalized to those for acne vulgaris. Associations between DALY burden and search interest were assessed using Spearman's correlation coefficient.

Results: A positive correlation was observed between DALY burden and search interest (Spearman's correlation coefficient $\rho = 0.60$; $P = 0.024$). Acne vulgaris demonstrated a close alignment between the DALY rate (63.37 per 100,000) and the RSV value (76). Conditions with high DALY burden but low visibility included dermatitis (DALY rate = 113.24; RSV value = 8) and psoriasis (DALY rate = 66.6; RSV value = 16). Conversely, pruritus and scabies showed disproportionately high search interest relative to their DALY burden. Malignant melanoma (DALY rate = 18.5; RSV value = 3), squamous cell carcinoma (DALY rate = 14.37; RSV value = 1), and basal cell carcinoma (DALY rate = 0.01; RSV value = 1) had minimal digital visibility despite their clinical importance.

Conclusion: Google search activity captures only part of the epidemiological landscape of dermatological disease in Türkiye. Symptom-driven or highly visible conditions receive substantial attention, while chronic inflammatory diseases and dermatological malignancies remain markedly underrepresented. These discrepancies indicate missed opportunities for targeted awareness and early detection strategies, particularly for skin cancers where timely presentation is essential.

Keywords: Disability-adjusted life years, Google Trends, information seeking behavior, skin diseases, Türkiye/epidemiology

Introduction

Skin diseases constitute a significant public health problem because of their high prevalence and substantial impact on quality of life.[1] The burden of these diseases is typically measured using the disability-adjusted life year (DALY) metric, which combines years of life lost due to premature death with years lived with disability.[2] While DALY burden data provide an objective measure of disease impact, they may not fully reflect public awareness or information-seeking behavior.[3]

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In recent years, digital data sources have emerged as valuable tools for assessing public interest in health-related issues. Digital health data, particularly from Google Trends (GTs), offer new insights into how societies perceive and prioritize health concerns.[4] Previous studies have used search patterns to monitor infectious diseases and public responses during health crises.[5,6] However, little is known about whether the dermatological disease burden aligns with digital search interest, and this relationship has rarely been investigated in countries with high dermatological disease prevalence and rapidly expanding digital health engagement, such as Türkiye.[7] Beyond its national relevance, Türkiye's large and diverse population, positioned at the crossroads of Asia and Europe,[8] makes it a valuable context to generate insights applicable to other regions with similar demographic and digital health dynamics.

Against this background, this study investigates the relationship between DALY rates and GTs search interest for 14 dermatological diseases using 2021 data from Türkiye, aiming to delineate potential concordance or divergence between epidemiological burden and patterns of public information-seeking behavior.

Materials and Methods

Study Design and Data Sources

DALY estimates for dermatological diseases in 2021 were obtained from the Global Burden of Disease (GBD) database for Türkiye.[9] The 14 conditions with the highest DALY rates were included: dermatitis, psoriasis, scabies, non-melanoma skin cancer (squamous cell carcinoma and basal cell carcinoma), malignant melanoma, fungal skin diseases, viral skin diseases, acne vulgaris, alopecia areata, bacterial skin diseases, pruritus, urticaria, and decubitus ulcer.

Search Term Identification and Query Strategy

To capture search behavior consistent with terms used by the public, disease names were complemented with lay expressions identified from patient information brochures published by the Turkish Dermatology Association. Both medical terms and alternative names commonly used in everyday language were employed as search queries (Table 1).[10] Searches were conducted on the GTs platform (https://trends.google.com) using the following parameters: region = Türkiye; time frame = January 1, 2021-May 12, 2025; category = all categories; search type = web search.

The GBD data were restricted to 2021, as this represents the most recent year for which DALY estimates are available. In contrast, GTs data were collected through May 12, 2025, to mitigate potential distortions in search behavior during the coronavirus disease-2019 (COVID-19) pandemic year (2021) and better capture overall search patterns and long-term public interest trends, consistent with prior approaches that compared disease burden with multi-year search data.[11]

Normalization and Data Processing

GT provides relative search volume (RSV) values normalized on a scale from 0 to 100. Because the platform allows comparison of up to five terms at a time, "acne vulgaris," the condition with the highest overall search

Table 1. Turkish search terms used for Google Trends analysis by disease

Disease	Search terms
Acne vulgaris	"akne vulgaris", "sivilce", "akne"
Psoriasis vulgaris	"psoriasis vulgaris", "sedef", "sedef hastalığı", "psoriasis"
Alopecia areata	"alopesi areata", "saç kıran", "sakal kıran"
Urticaria	"ürtiker", "kurdeşen"
Malignant melanoma	"malign melanom", "melanom", "ben kanseri"
Scabies	"scabies", "skabiyez", "uyuz"
Pruritus	"pruritus", "kaşınma", "kaşıntı"
Basal cell carcinoma	"bazal hücreli karsinom", "bazal hücreli kanser", "BCC"
Squamous cell carcinoma	"skuamöz hücreli karsinom", "skuamöz hücreli kanser", "SCC"
Viral skin diseases	"siğil", "uçuk", "Herpes", "molloskum", "molloscum", "zona", "gece yanığı", "6. hastalık", "virüs ve deri"
Bacterial skin diseases	"selülit", "impetigo", "pyoderma", "abse", "çıban", "fronkül", "karbonkül", "eritrezma", "lenfadenit", "bakteri ve deri"
Fungal skin diseases	"tinea", "tırnak mantarı", "deri mantarı", "saç mantarı", "deri ve mantar"
Decubitus ulcer	"dekubit ülseri", "bası yarası", "yatak yarası", "dekubit yarası"
Dermatitis	"dermatit", "egzema", "ekzema", "atopik dermatit", "atopik egzema", "seboreik dermatit", "kontakt dermatit", "allerjik egzema"

Search terms include both English medical terminology and Turkish colloquial terms commonly used by the general population. For each disease category, the term group with the highest search interest was identified and used as the representative search term

interest, was used as the reference term in all queries. RSV values for other conditions were normalized relative to acne to ensure comparability. Weekly RSV data retrieved from multiple GT sessions were merged into a unified dataset, and annual mean RSV values were calculated for subsequent correlation analyses. Within each disease category, the search term with the highest average RSV was selected as representative. Complete lists of all search terms and their corresponding weekly RSV data are provided in Supplementary Table 1.

Comparative Analysis

Normalized annual RSV values were compared with DALY burden estimates for Türkiye in 2021 to evaluate the relationship between public information-seeking behavior and the epidemiological burden of dermatological diseases.

Statistical Analysis

The distribution of normalized RSV and DALY data was first examined for normality using the Shapiro–Wilk test. As the data did not meet the assumptions of normality, non-parametric analyses were performed. Associations between disease-specific DALY rates and mean RSV values were assessed using Spearman's rank correlation coefficient (ρ). Scatterplots of GT-derived mean RSV versus $\log_{10}$-transformed DALY rates were generated to visualize these relationships, and ordinary least squares regression lines ($y = \beta_0 + \beta_1 x$, R^2) were superimposed as visual aids. Rank-discordance scores, calculated as (DALY rank–GT rank), were used to quantify discrepancies between disease burden and public interest. All analyses were conducted in R (version 4.5.1), with statistical significance set at $P < 0.05$.

Ethics Statement

This study was based exclusively on publicly available, de-identified data obtained from the GBD database and GTs platform. No individual-level or sensitive personal information was accessed. Accordingly, the analysis did not require approval from an institutional review board or informed consent from participants.

Results

Disease Burden

According to the GBD 2021 estimates for Türkiye, DALY rates for the 14 dermatological conditions ranged from 0.01 to 113.24 per 100,000 population. Dermatitis had the highest burden (113.24 per 100,000 population), followed by psoriasis (66.60 per 100,000), acne vulgaris (63.37 per 100,000), and urticaria (47.94 per 100,000). Alopecia areata (6.18), decubitus ulcer (4.33), and basal cell carcinoma (0.01) had the lowest burden. The overall mean DALY rate was 30.9 [standard deviation (SD) = 32.0], and the median was 18.7 [interquartile range (IQR) = 37.0] (Table 2).

Search Interest

GTs data from January 2021 to May 2025 yielded RSV values between 1 and 76. Acne vulgaris had the highest RSV (76), followed by viral skin diseases (47), pruritus (38), and

Table 2. Google Trends scores and disability-adjusted life year (DALY) rates for skin diseases in Türkiye

Disease	2021 DALY rate (per 100,000)	95% CI	Google Trends score (0-100)
Acne vulgaris	63.37	38.04-99.70	76
Viral skin diseases	36.82	23.30-55.54	47
Pruritus	11.44	5.58-20.66	38
Scabies	23.86	13.06-39.00	34
Urticaria	47.94	31.84-67.52	24
Psoriasis vulgaris	66.60	48.30-88.52	16
Bacterial skin diseases	7.01	4.97-10.25	12
Dermatitis	113.24	65.46-180.77	8
Fungal skin diseases	18.90	7.71-38.45	7
Alopecia areata	6.18	3.95-8.90	6
Malignant skin melanoma	18.50	8.92-24.86	3
Squamous cell carcinoma	14.37	11.25-19.43	1
Decubitus ulcer	4.33	2.35-5.56	1
Basal cell carcinoma	0.01	0.00-0.01	1

Data are sorted by Google Trends score in descending order. Google Trends scores range from 0 to 100, with higher values indicating greater search interest. CI: Confidence interval

scabies (34). Malignant melanoma (RSV = 3), squamous cell carcinoma (RSV = 1), basal cell carcinoma (RSV = 1), and decubitus ulcer (RSV = 1) had the lowest RSVs. The mean RSV across all conditions was 19.6 (SD 22.1), and the median was 10.0 (IQR: 27.8).

Correlation Between DALY and Search Interest

Spearman's rank correlation coefficient demonstrated a positive association between DALY burden and RSV values ($\rho = 0.60$; $P = 0.024$; 95% confidence interval: 0.10–0.86). Figure 1 presents the distribution of conditions, with $\log_{10}$-transformed DALY rates plotted against mean RSV values. An ordinary least-squares regression line was added for visualization.

Rank-Discordance Analysis

Rank-discordance scores (DALY rank minus RSV rank) quantified the divergence between epidemiological burden and search interest (Figure 2). Conditions with a higher search rank relative to their burden included pruritus (+7), bacterial skin diseases (+4), viral skin diseases (+3), alopecia areata (+2), scabies (+2), and acne vulgaris (+2). Conditions with a lower search rank relative to their burden included dermatitis (–7), psoriasis (–4), malignant melanoma (–3), squamous cell carcinoma (–3), fungal skin diseases (–2), and urticaria (–1). The Decubitus ulcer showed a minimal discrepancy (+1).

Discussion

This study demonstrated a statistically significant positive association between the epidemiological burden of dermatological diseases, measured by DALYs, and public interest as reflected in GTs search volumes in Türkiye ($\rho = 0.60$, $P = 0.024$). Beyond the overall positive correlation, specific patterns emerged when comparing disease burden and search behavior. Acne vulgaris exemplified the "high DALY, high search interest" category, reflecting strong concordance between objective burden and public attention. In contrast, dermatitis and psoriasis, despite being among the leading contributors to DALYs, demonstrated disproportionately low search interest (RSV values of 8 and 16, respectively). Conversely, conditions such as pruritus and scabies displayed relatively higher search volumes compared with their DALY burden, suggesting that symptomatic distress and transmissibility may shape digital health-seeking behavior. Finally, skin malignancies, including malignant melanoma and non-melanoma skin cancers, exhibited moderate-to-high DALYs but minimal search activity, indicating potential gaps in public awareness of oncologic dermatology.

Although dermatitis and psoriasis ranked among the leading contributors to DALYs, their corresponding search interest remained disproportionately low. Dermatitis, with the highest DALY burden among all conditions (113.24 per 100,000), had only a minimal RSV (8), whereas psoriasis, the second-highest DALY contributor (66.6 per 100,000), was similarly underrepresented in public search behavior (RSV = 16). This divergence suggests that despite their substantial

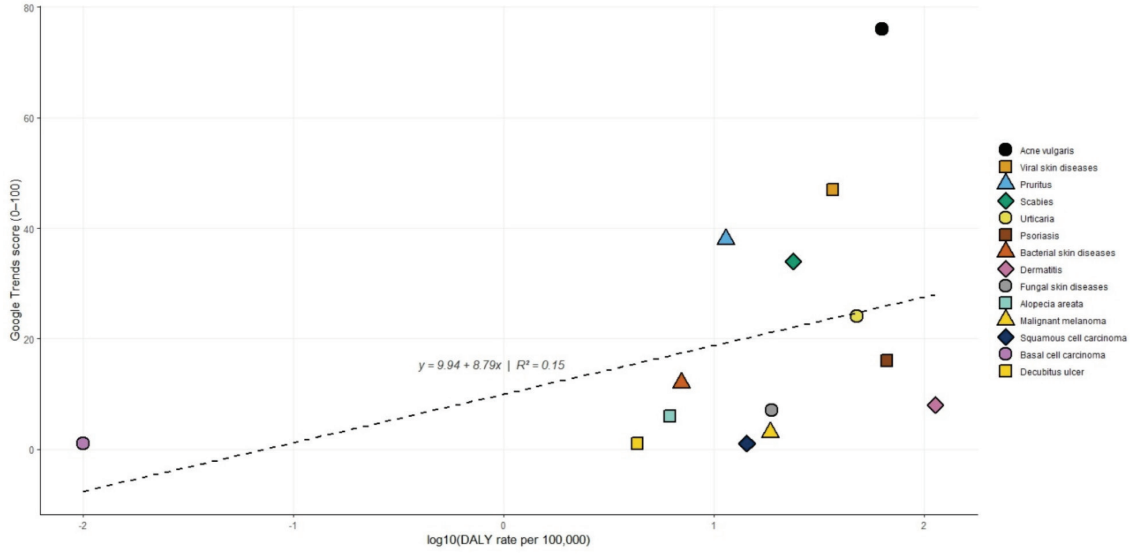

Figure 1. Correlation between disease burden and public search interest for skin diseases. Scatter plot showing the relationship between $\log_{10}$-transformed disability-adjusted life year rates per 100,000 population (x-axis) and Google Trends scores (y-axis, 0-100 scale) for 14 skin diseases in Türkiye. Each point represents a different skin disease as indicated in the legend. The dashed line represents the linear regression fit ($y = 9.94 + 8.79x$, $R^2 = 0.15$), indicating a weak positive correlation between disease burden and public search interest. Notable outliers include acne vulgaris with disproportionately high search interest relative to its disease burden

epidemiological impact, chronic and often normalized skin conditions may elicit limited digital attention, with online engagement tending to peak during treatment decisions or symptomatic flare-ups.[12] International evidence indicates that sustained awareness initiatives, such as World Psoriasis Day and Eczema Awareness Week, can generate measurable increases in online search activity, underscoring the role of advocacy-driven campaigns in amplifying visibility for chronic inflammatory skin diseases.[13-15] In Türkiye, however, comparable large-scale, digitally oriented efforts appear less prominent, which may partly account for the disproportionately low search interest in psoriasis and atopic dermatitis despite their substantial DALY burden.[16] Regional analyses of Google and YouTube activity for these conditions further demonstrate considerable geographic variability, suggesting that local health communication environments substantially shape digital health-seeking behavior.[17] Collectively, these factors may help explain the "high DALY–low RSV" pattern observed in Türkiye.

Skin malignancies, despite their substantial disease burden and associated mortality, exhibit markedly limited digital visibility. Malignant melanoma (DALY rate = 18.5) attracted minimal search interest (RSV value = 3), whereas squamous cell carcinoma (DALY rate = 14.37) and basal cell carcinoma (DALY rate = 0.01) attracted negligible online attention (RSV value = 1 each). This underrepresentation likely stems from the lower overall prevalence of these malignancies than common conditions such as acne, and from the predominance of skin cancers in older age groups, who typically have lower digital engagement and technology use than younger populations.[12,18] Although these demographic and epidemiological factors partially explain the low search volume, the persistently limited digital interest in life-threatening conditions indicates that current digital health strategies fail to effectively reach high-risk groups, reflecting a substantial awareness gap.[4] Such discrepancies underscore a critical void in public health messaging in Türkiye. While international experience, particularly in Australia, demonstrates that sustained digital outreach can drive measurable rises in search activity and early detection,[19] Türkiye currently lacks comparable high-visibility campaigns.[18] Addressing this deficit through targeted, age-sensitive, and digitally integrated strategies could help bridge the gap between clinical reality and public information-seeking behaviors.

Acne vulgaris had the highest GTs score (RSV value = 76), consistent with its DALY rate of 63.37 per 100,000, while viral skin diseases ranked fourth in DALY rate (38.82) but second in search interest (RSV value = 47). Their high visibility likely reflects both prevalence and impact on younger age groups.[12] Yet, elevated digital attention carries risks: for acne, misinformation and reliance on unverified online remedies can drive self-medication and delay professional care;[20] for viral skin diseases, public concern may amplify unfounded fears or promote ineffective treatments.[21] Such behaviors not only increase the risk of poorer outcomes but may also lead to increased economic costs through unnecessary product

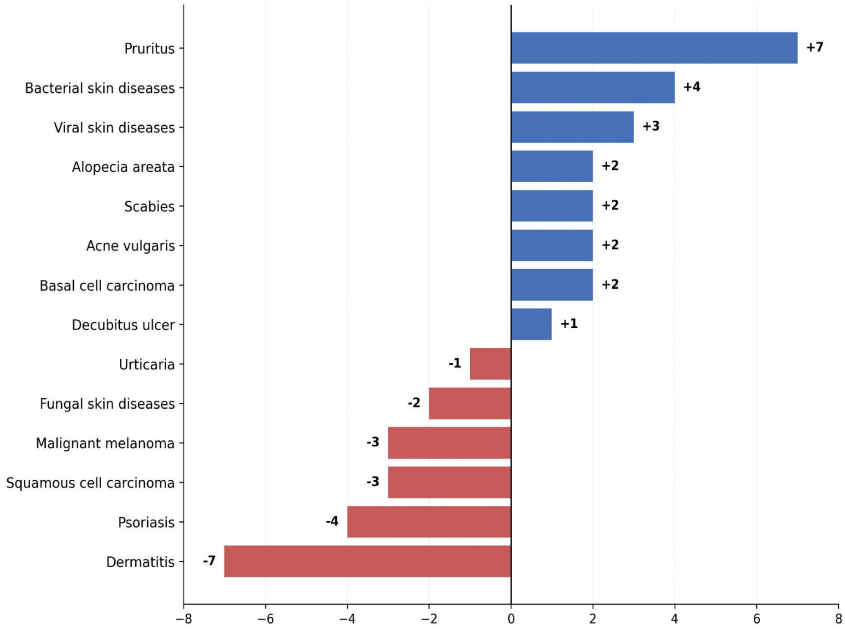

Figure 2. Difference between Google Trends search interest and disease burden for skin diseases in Türkiye. The horizontal axis represents the difference score between normalized Google Trends search interest and disability-adjusted life year burden. Positive values (blue bars) indicate diseases with higher search interest relative to their disease burden (over-represented in public interest), while negative values (red bars) indicate diseases with lower search interest relative to their disease burden (under-represented in public interest)

use and avoidable complications.[22] These findings highlight the need for reliable digital resources and targeted health communication to channel high online engagement into evidence-based care.

Pruritus and scabies, despite relatively low DALY rates (11.44 and 23.86 per 100,000, respectively), attracted disproportionately high levels of public search interest (RSV values of 38 and 34, respectively). This pattern highlights the influence of symptom-driven distress and transmissibility in shaping digital health-seeking behavior. Itch, while not life-threatening, is known to significantly impair quality of life and frequently triggers online information seeking.[23] In Türkiye, the elevated digital prominence of scabies appears to have been further reinforced by recent public health crises. During the COVID-19 pandemic, reduced access to dermatology services and increased household crowding contributed to rising incidence across several regions.[24] Likewise, following the 2023 Kahramanmaraş earthquakes, mass displacement and overcrowded shelters created favorable conditions for outbreaks of contagious skin diseases, including scabies.[25] These factors not only exacerbated the epidemiological burden but also intensified public concern, which likely translated into increased online search activity.

Building upon international evidence and comparative infodemiological patterns, we developed a Türkiye-specific digital dermatology recommendation framework (see Table 3) to guide national strategies for awareness, prevention, and surveillance.[13,19,20,26-30] The findings of this study underscore the potential of digital data to complement traditional epidemiological metrics in dermatology. The divergence observed between burden and search activity for certain conditions highlights the necessity of integrating digital surveillance tools into public health planning. Infodemiological approaches have been increasingly recognized for their ability to identify gaps in awareness, anticipate emerging health concerns, and guide resource allocation. In dermatology, where conditions vary widely in terms of visibility, symptom distress, and public perception, such methods may support more tailored health communication strategies and awareness campaigns, ultimately bridging the gap between epidemiological reality and societal priorities.

Study Limitations

Some limitations of this study should be acknowledged. GTs data reflect relative rather than absolute search volumes and may not capture differences across all demographic groups. In addition, the analysis was restricted to a selected group of dermatological conditions, which may not fully represent the broader spectrum of public interest in skin health. Future research incorporating a wider range of health conditions would be valuable to provide a more comprehensive understanding of digital health-seeking behavior.

Conclusion

The results of this study demonstrate that digital search interest and disease burden are not always proportionally aligned. While certain dermatological conditions with high DALY rates attract substantial public attention online, others remain underrepresented in digital searches despite their clinical significance. Understanding these discrepancies can help guide more effective public health messaging and awareness efforts, ensuring that educational and preventive strategies are not only informed by epidemiological data but also attuned to the patterns of public concern and curiosity.

Table 3. Alignment between disease burden and public search interest in dermatological conditions (Türkiye, 2021–2025)

Disease group	DALY–RSV pattern	Interpretation	Public health action
Chronic inflammatory dermatoses (dermatitis, psoriasis)	High DALY, Low RSV	- Fluctuating course[12] - Low visibility in campaigns[13]	- Develop condition-specific awareness campaigns[13,26] - Expand verified online educational tools[26]
Oncologic dermatology (melanoma, NMSC)	Moderate DALY, Very low RSV	- Low symptom salience[18,19] - Sparse digital campaigns[19]	- Promote early detection via digital tools[19,27] - Strengthen NGO–state outreach models[19,27]
Symptomatic/transmissible diseases (pruritus, scabies)	Low DALY, High RSV	- High symptom burden[23] - Epidemic contexts (e.g., COVID-19, earthquakes)[24,25]	- Monitor RSV for outbreak signals[28,29] - Embed messages into social media channels[28]
High-prevalence, visible skin conditions (acne, viral dermatoses)	High DALY, High RSV	- High youth prevalence[20] - Cosmetic/social concern[20,21]	- Improve digital health literacy[20,30] - Dispel misinformation through verified portals[30]

DALY: Disability-adjusted life year, RSV: Relative search volume, NMSC: Non-melanoma skin cancer, NGO: Non-governmental organization, COVID-19: Coronavirus disease-2019

Ethics

Ethics Committee Approval: This study was based exclusively on publicly available, de-identified data obtained from the Global Burden of Disease database and Google Trends platform. No individual-level or sensitive personal information was accessed.

Informed Consent: Accordingly, the analysis did not require approval from an institutional review board or informed consent from participants.

Footnotes

Authorship Contributions

Concept: A.U.A., Design: A.U.A., N.Ç., Data Collection or Processing: A.U.A., N.Ç., Analysis or Interpretation: A.U.A., N.Ç., Literature Search: A.U.A., N.Ç., Writing: A.U.A., N.Ç.

Conflict of Interest: The authors declared that they have no conflict of interest.

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Supplementary Table 1: https://d2v96fxpocvxx.cloudfront.net/66b874bd-7aaa-4f61-9199-52f558d61c0d/content-images/5dbb2023-e2aa-42d5-b48c-bfe51b306f9f.pdf