



COVID-19 Led to an Increased Online Search Interest for “Urticaria”

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Abstract

Background/Aim: Google Trends is a powerful tool for health information access and disease surveillance, including COVID-19 data forecasting. Cutaneous manifestations of COVID-19 include urticarial rash, which is multifactorial and may indicate a better prognosis. Aim of this study was to analyse the search queries for the term “urticaria” during the six years period (2017-2022) and assess the relationship between relative search volume (RSV) and a global rise in COVID-19 cases.

Methods: This study examined search queries for "urticaria" from 2017 to 2022, exploring the relationship between RSV and global COVID-19 cases. Data on "urticaria" search volume in various countries were collected using Google Trends. Microsoft Excel and correlation analysis were used to analyse the data and investigate the association between search volume and monthly COVID-19 case rise.

Results: During 2017-2019, the mean RSV for "urticaria" was 69.9 ± 10.1 , which increased to 84.1 ± 8.6 during 2020-2022. The difference in means was statistically significant ($p < 0.001$). The mean RSV in 2022 (94.3) was the highest among all years studied. The increase in RSV from 2020 to 2022 moderately correlated ($r = 0.56$) with monthly COVID-19 case rise ($p < 0.001$). Nicaragua showed the highest search interest, while Africa, North America, Asia and Pacific, the Middle East and Europe had low search interest.

Conclusions: This study identified a significant increase in search volume for "urticaria" during the COVID-19 pandemic. Nicaragua had the highest search interest, while English-speaking countries displayed low interest. Language variation, cultural differences and COVID-19-related health concerns may influence public interest in urticaria. These findings can aid public health officials in understanding public health concerns and tailoring effective health communication strategies.

Key words: COVID-19; Skin manifestation; Urticaria; Hives; Trends.

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Introduction

Google Trends (<https://trends.google.com/trends>) is a free, publicly accessible online portal of *Google Inc* that displays the volume of search terms entered into the Google search engine. It is a robust tool for seeking health information and

disease surveillance and has a crucial role in forecasting COVID-19-related data.^{1, 2} Google Trends provides data on the frequency of search terms dating back to January 2004. Users can download search output for analysis in “.csv” format.

It determines the proportion of searches (relative search volume) for a specified term in the Google search database.

The first cases of COVID-19 were reported in Wuhan, China, in December 2019. This disease was subsequently declared a pandemic by World Health Organization (WHO) in early March 2020.³ The clinical features of the disease are heterogeneous and non-specific and the most common symptoms are cough, dyspnoea, fever, fatigue, myalgia, anorexia, ageusia, anosmia, pharyngodynia, headache and chills.⁴ The cutaneous manifestations of COVID-19 have been categorised into six categories: urticarial rash, confluent erythematous/ maculopapular/ morbilliform rash, papulovesicular exanthem, chilblain-like acral pattern, livedo reticularis/ racemose-like pattern and purpuric “vasculitic” pattern.⁵ Urticarial rash in patients with COVID-19 is the presenting complaint or observed before other classical symptoms of COVID-19. It may also appear after the onset of symptoms of COVID-19 in patients with no previous history of urticaria.⁶ The aetiology of urticarial rash in COVID-19 is multifactorial and probably attributed to systemic eosinophilia, degranulation of mast cells, the release of histamine from basophils, circulating immune complexes, activation of the complement pathway resulting in increased vascular permeability and oedema associated with the rash.⁷ In addition, patients with COVID-19 who have urticaria may have a better prognosis.⁸

The onset of COVID-19 has ushered in an “infodemic” with increased search interest for medical information. This study aimed to analyse the search queries for the term “urticaria” during the six years period (2017-2022) and assessed the relationship between relative search volume (RSV) and a global rise in COVID-19 cases.

Methods

Retrospective observational study was performed. The monthly search volume index (SVI) of Google Trends was analysed from the period January 2017 to December 2022 as a “web search” under the following filters: “worldwide” and “all categories.” WHO dataset for daily coronavirus cases was utilised to assess the relation-

ship between the onset of COVID-19 and a change in Google search trend for the term “urticaria”.⁹ The RSV of the search queries was classified as very low (0-25), low (25-50), high (50-75) and very high (75-100).

Statistical analysis

All data used in this study were available in open source and no explicit permission was required to utilise them. Microsoft Excel was used for computations and statistical inference. Two sample t-tests and Pearson correlation tests with unequal variance were applied to calculate the difference in mean values and determine the correlation between RSV for the term “urticaria” and COVID-19.

Results

The mean RSV for the term “urticaria” during 2017-2019 was 69.9 ± 10.1 , while 84.1 ± 8.6 during 2020-2022. The difference in the mean values was statistically significant (two-tailed $p < 0.001$). The mean RSV during 2022 was higher (94.3) than any other year of the study period. An increase in RSV during 2020-2022 was moderately correlated ($r = 0.56$) with the monthly rise in COVID-19 cases ($p < 0.001$).

Nicaragua, the only country in the South/ Central American region, had a very high RSV (96). South/Latin America (excluding Haiti, Saint Lucia and Jamaica because of lack of data) had an average RSV of 56.9 (Table 1). Cuba had the highest search interest (100) among all the countries. Africa, North America, Asia and Pacific, the Middle East and Europe had a very low search interest (0-25). The search interest for the term “urticaria” was interestingly low in countries with the highest English-speaking populations - United Kingdom, United States and Canada (Table 2).

Table 1: Relative search volume (RSV) for the term “urticaria” according to geographical regions categorised by International Telecommunications Union

Region	RSV
South/Central America	96.0
South/Latin America	56.9
Africa	23.0
North America	21.5
Asia and Pacific	20.3
Middle East	16.5
Europe	13.8

Table 2: Geographical distribution of relative search volume (RSV) for the term “urticaria” during 2017-2022

Country	RSV	Country	RSV	Country	RSV	Country	RSV
Cuba	100	Brazil	42	Jordan	22	Thailand	9
Nicaragua	96	Uruguay	40	India	21	Hungary	9
Honduras	86	Dominican Republic	39	Canada	21	South Korea	8
Peru	80	Venezuela	38	Nigeria	20	Sweden	8
Puerto Rico	78	Nepal	33	Kenya	20	Austria	8
El Salvador	72	Singapore	33	Netherlands	19	Taiwan	7
Chile	70	United Arab Emirates	32	Norway	18	Finland	7
Paraguay	66	Portugal	32	Hong Kong	18	Germany	5
Panama	65	Qatar	30	Bangladesh	17	Indonesia	5
Ecuador	63	Ghana	29	Sri Lanka	15	Iran	2
Guatemala	63	United Kingdom	27	Romania	14	Italy	2
Costa Rica	63	Ireland	27	Denmark	13	Turkey	1
Philippines	61	Malaysia	25	Saudi Arabia	13	Poland	1
Colombia	59	Pakistan	25	Iraq	13	France	1
Bolivia	56	Australia	24	Belgium	12	Japan	1
Mexico	54	New Zealand	23	Israel	10		
Argentina	49	South Africa	23	Egypt	10		
Spain	49	United States	22	Switzerland	9		

Many countries are excluded due to lack of search data.

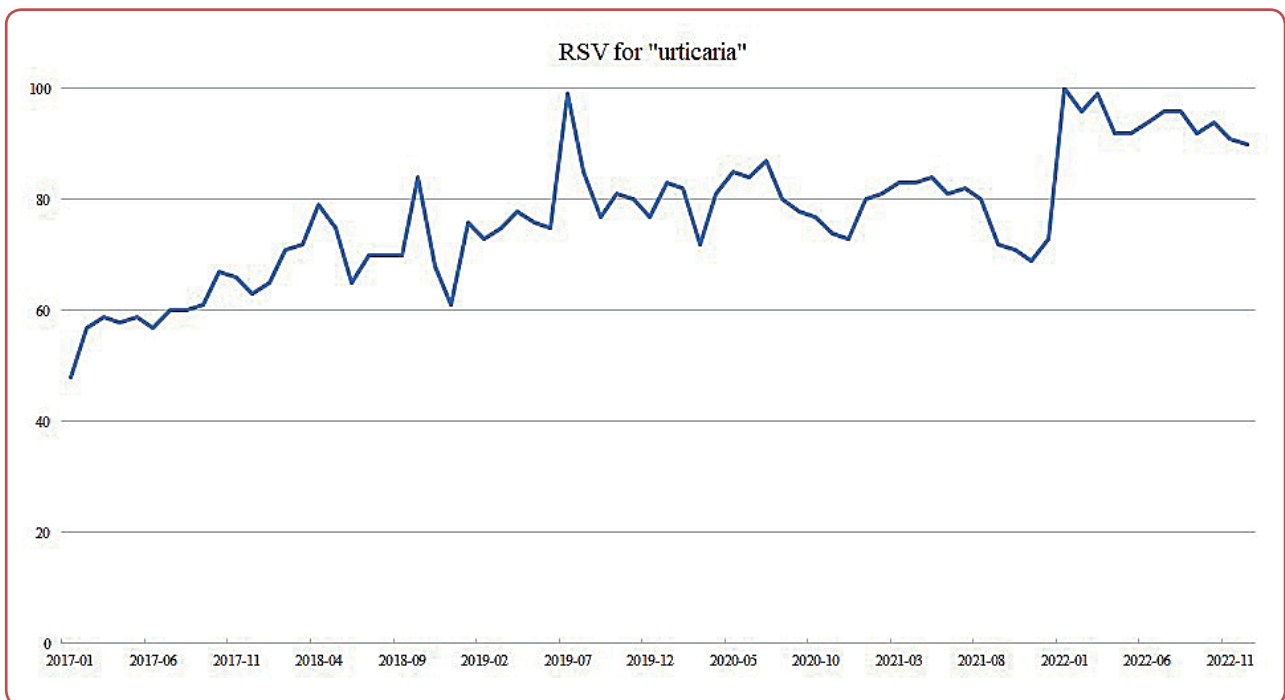


Figure 1: Relative search volume (RSV) for the term “urticaria” from 01/2017-12/2022

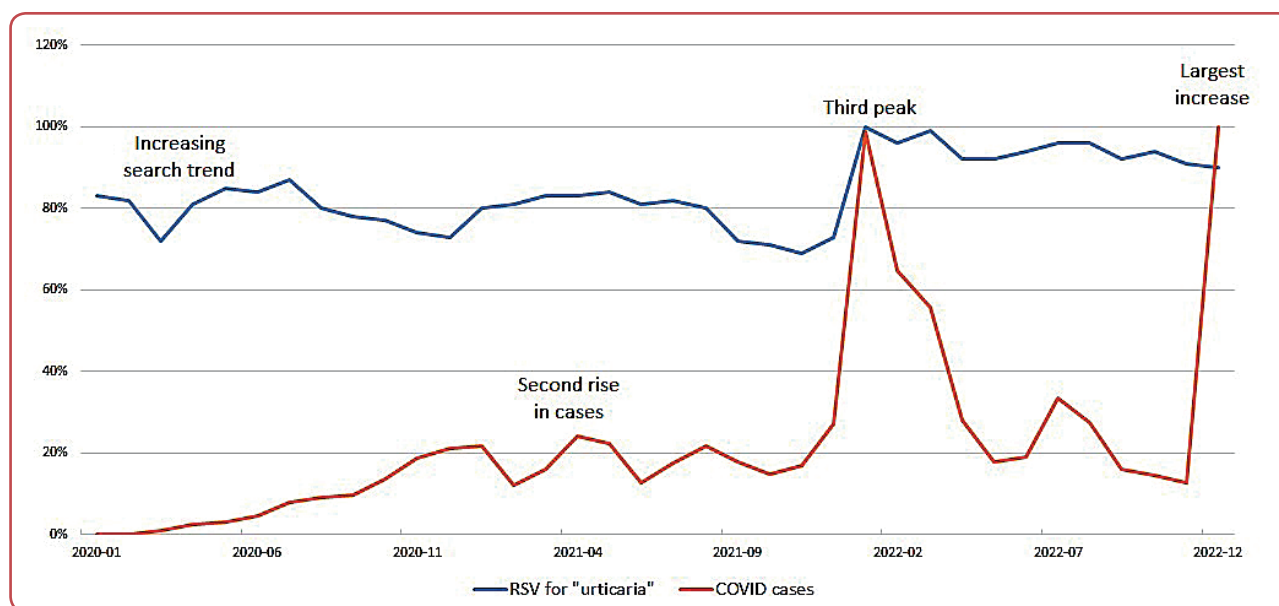


Figure 2: Relative search volume (RSV) for the term “urticaria” and COVID-19 cases (in terms of proportion of cumulative cases till 12/2022) plotted as percentages

Turkey, Poland, France and Japan had negligible (1) search interest. Although China and India had the highest internet users¹⁰ they had disproportionately low search interest.

There was increased search interest for the term “urticaria” during the period 2020-2022, more prominently since the beginning of 2022, which has followed an upward trend (Figure 1). This increased search interest was correlated with the monthly increase in coronavirus cases during the same period.

An increase in the number of SARS-CoV-2 infections and search trend for the term “urticaria” was observed (Figure 2):

1. The cases of SARS-CoV-2 infections increased globally over the first several months of the pandemic, with a notable trend that began in April 2020. There was a concurrent rise in search trend for the term “urticaria” followed by a gradual decline over the year.
2. A second rise in global infections followed the delta variant surge in India in April 2021, which declined by June 2021.¹¹ The spread of the delta variant across the globe led to another surge in July 2021. However, a rise in search trend during this period preceded the increased number of infections by about four months and was persistently high until a decline in global COVID-19 cases and search interest for the term “urticaria” around October 2021.

3. A third peak was observed after a sharp rise in the number of new weekly cases during January 2022. It was associated with an abrupt increase in the search volume, which followed the elevated trend with RSV > 90 throughout the year.

4. The largest increase in the number of new infections was observed in December 2022, which was not associated with any immediate increase in RSV.

Discussion

Google Trends is a tool that displays search output as an index of the total searches within specified geographical locations and periods. It helps assess public interest dynamics, which may help disseminate information and plan public health interventions. Google Trends creates an SVI containing the RSV of the term, which is reported as a standardised measure ranging from 0 (not enough data) to 100 (peak of search activity).^{9, 12} In addition, online interest for up to five different search terms can also be compared to analyse search trends between specific geographic areas and periods. The user can choose from 25 specific topic categories to restrict the search, each with multiple subcategories for > 300 choices in total.¹

Urticaria associated with COVID-19 and the vac-

cine administered for its prevention appears to be acute. Chronic spontaneous urticaria (CSU) or delayed onset urticaria is relatively uncommon after administering the first dose of the vaccine.^{13, 14} CSU has been observed with increased exacerbations, severity and complicated treatment associated with COVID-19.¹⁵ In addition, there are reports of the onset of urticaria after the third dose of the COVID-19 vaccine in patients with no previous history of urticaria after administering the first two doses.¹⁶ Moreover, COVID-19 has been increasingly associated with urticaria as a presenting feature or manifestation of the viral infection.^{6, 15}

There was geographic variation in the search interest, which was very high (> 75) in the South/Central American region (96). South/ Latin America had a high RSV (50-75) with an average value of 56.9 (Cuba had the highest search interest (100) among all the countries). Africa, North America, Asia and Pacific, the Middle East and Europe had a very low search interest (0-25). RSV was low in many countries, including those with maximum English-speaking populations, like the United Kingdom (27), the United States (22) and Canada (21). The search interest was almost negligible (1) in Turkey, Poland, France and Japan.

Increasingly more people have been searching for online resources during the pandemic. During the first year of the pandemic in 2020, there was a significant increase in internet users by 10.2 % (the largest increase in a decade), driven by developing countries.¹⁷ An increased number of publications for COVID-19-associated urticaria during the pandemic could have also influenced the search interest for the term.^{7, 8}

Increased search interest for the term “urticaria” appears to be correlated with the monthly increase in coronavirus cases. This suggests that people may be experiencing skin-related symptoms, such as hives or rashes, as a result of contracting COVID-19. Healthcare professionals should consider including skin-related symptoms as part of the clinical evaluation of patients with COVID-19.

The RSV for the term “urticaria” varied widely by country. Countries with a high search volume may have a larger population with COVID-19 related skin symptoms, or there may be a higher awareness of the connection between COVID-19 and skin symptoms in those countries. Converse-

ly, countries with low search volumes may not have as much awareness of the link between COVID-19 and skin symptoms, or they may be using different terms to describe skin symptoms.

The trend in search interest for the term “urticaria” could have been useful as an early indicator of COVID-19 infection rates. In particular, the increase in search trend during the year 2021 preceded the increased number of infections by about four months, suggesting that monitoring search trends could provide valuable insights into the trajectory of the pandemic. However, the results also highlight the importance of considering linguistic and cultural factors when analysing search trends. The attenuated interest in some countries may be due to language variations or cultural differences in how skin symptoms are described or understood.

Conclusion

Presented study leveraged Google Trends as a pivotal tool to track and analyse global search behaviour related to “urticaria” in the context of the COVID-19 pandemic. The correlation between increased search interest and the surge in COVID-19 cases suggests that urticaria may serve as a significant, albeit indirect, dermatological manifestation of the virus. This pattern underscores the necessity for healthcare professionals to be vigilant about skin-related symptoms as potential indicators of COVID-19.

Moreover, the geographical disparities in search interest highlight the importance of public awareness and the need for targeted educational campaigns, particularly in regions with lower search volumes to help in early identification and management of COVID-19 cases. The temporal alignment between search trends and infection rates, particularly noted ahead of infection peaks, suggests that real-time data from Google Trends could serve as an early warning system for healthcare authorities and policymakers. This, however, would require careful consideration of linguistic, cultural and regional differences that may affect search behaviour.

Lastly, the findings of this study call for an integrated approach combining digital epidemiology tools like Google Trends with tradition-

al epidemiological methods. Such a strategy could enhance our understanding of COVID-19 and its myriad manifestations, leading to more effective public health responses and intervention strategies. The study exemplifies the potential of leveraging online data to enhance real-world health outcomes.

Data access

The data that support the findings of this study are available from the corresponding author upon reasonable individual request.

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