



Early View

Research letter

Assessing self-medication for obstructive airway disease during COVID-19 using *Google Trends*

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Assessing self-medication for obstructive airway disease during COVID-19 using *Google Trends*

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Take home message: *Google Trends* reveals public information seeking for self-medication in patients with obstructive respiratory disease during the COVID-19 outbreak, illustrating the urgent need to implement digital-health support in patients with respiratory disease.

To the Editor:

Chronic obstructive pulmonary disease (COPD) is a leading cause of morbidity and mortality worldwide affecting approximately 294 million people worldwide, and accounting for over 3 million deaths annually. Similarly, asthma affects approximately 268 million people worldwide leading to an enormous health burden [1]. With the outbreak of the Coronavirus disease 2019 (COVID-19) pandemic, the Global Initiative for Chronic Obstructive Lung Disease (GOLD) set a main emphasis on recommendations focused on the regular use of bronchodilator maintenance therapy and the Global Initiative for Asthma (GINA) guidelines 2020 explicitly state that inhaler therapy, especially the maintenance therapy with inhaled corticosteroids (ICS), should not be interrupted during the pandemic [1,2].

Coinciding with the outbreak of COVID-19 in Austria with its first major hot-spot in the Alpine state of Tyrol (inhabitants: 757,852; capital: Innsbruck), and during its associated lockdown (18 March – 7 April, 2020), we experienced a dramatic decrease in COPD-related hospitalizations at the Department of Internal Medicine, Innsbruck Medical University. Therefore, using Google's search engine data analysis tool *Google Trends* (<https://trends.google.com/trends/>)[3], we aimed to investigate as to whether patients suffering from COPD and/or asthma may have consulted the internet for behavioral and self-medication advice.

As shown in **Figure (a)**, we observed a marked reduction in daily hospitalizations for COPD and asthma during the COVID-19 outbreak between February-April 2020 at our Department of Internal Medicine, when compared to the years 2017-2019. In line, we observed a drop in hospitalizations for non-COVID-19 pneumonia, whereas COVID-19 associated hospitalization rates dramatically increased, peaking on March 27, 2020. The yearly seasonal peak in influenza-associated admissions between November and end of March was significantly shortened this year (-19 ± 8 days compared to the mean duration in 2015-2019), which is consistent with the observed shortening of the influenza pandemic in the Northern hemisphere due to the lockdown and social-distancing measures reported by *FluNet* [4]. WHO-based *FluNet* also states that the ongoing COVID-19 pandemic may have influenced health-seeking behavior. Pre-existing conditions constituting a major risk for COVID-19 include asthma, COPD, hypertension, diabetes, and cancer [5]. Importantly, with the outbreak of the COVID-19 pandemic, much has been discussed about ACE inhibitors, hypertension and associated risks to experience a severe course of COVID-19, and apparently less about other risk factors including respiratory diseases [6].

On August 25 2020, we queried *Google Trends* and downloaded the data. Among the synonymous search terms for "COVID-19" suggested by *Google Trends* world-wide, the search term with the highest relative search volume (RSV) was by far "Coronavirus" and thus used in the current analysis

("Coronavirus" > "COVID-19" > "SARS"). When querying for the topics "chronic obstructive pulmonary disease" ("COPD") and "asthma" we observed a significant rise in RSVs from the end of February to the beginning of April 2020 when compared to the past three years (Asthma RSV 69 ± 19 vs 36 ± 1 $p < 0.01$; COPD RSV 28 ± 6 vs 19 ± 1 $p < 0.01$). Like Sharma et al. [7] we conducted a sub-analysis of individual countries, restricting the analysis to countries with sufficient internet traffic, well-documented COVID-19 burden, and comparable lockdown measures (USA, UK, Germany, France, Italy and Spain). Consistent results were observed when analyzing "asthma" and "COPD", with the exception of Italy showing no relevant elevation in "COPD" RSV during March 2020 (data not shown).

Comparing the search terms "coronavirus asthma" and "coronavirus COPD" with "coronavirus hypertension", "coronavirus diabetes" and "coronavirus cancer", we observed world-wide highest RSV for "coronavirus asthma" followed by "coronavirus diabetes" and "coronavirus cancer" (**Figure (b)**). Surprisingly, "coronavirus hypertension" ranked fourth together with "coronavirus COPD". When exploring the health-seeking behavior of patients affected by asthma and/or COPD during the COVID-19 outbreak, we focused on those therapeutic approaches with the highest RSV world-wide and thus comparable. As shown in **Figure (c)**, *Google Trends* analysis revealed highest RSV for topics "Salbutamol", "Montelukast", and "Ipratropium bromide", "Beclometasone", and "Fluticasone propionate" paralleling the world-wide COVID-19 outbreak. No consistent results could be observed when analyzing the RSVs of these medications in individual countries, probably reflecting the vast number of available products and country-dependent preferences (data not shown).

To summarize, our analysis revealed highest search volumes for asthma and asthma-associated medications, despite other risk factors like hypertension having been largely debated in the media [8]. In this context, asthmatics may represent a clearly younger collective than patients suffering from hypertension, thus potentially having an easier access to the internet. Age together with a more intuitive access to web-based search and advice may at least in part explain why the RSV for "asthma" and "coronavirus asthma" were found to be markedly higher than the RSV for "COPD" and "coronavirus COPD". On the other hand, it may also simply reflect the poor global awareness for COPD as shown in our previous report, where COPD ranked only 8th among the top 10 causes of death in high-income countries [3].

Interestingly, when focusing on inhaler therapy, search terms with highest RSV and thus suitable for our *Google Trends* analysis encompassed mainly relievers, i.e. short-term beta-agonists (SABA) as well as short-term muscarinic antagonists (SAMA), followed by inhaled corticosteroids (ICS), indicating patients were mainly seeking for advice in case of an exacerbation and potentially SARS-CoV-2 infection. Considering the GINA guidelines in which the authors explicitly state that asthma

treatment should no longer be based solely on short-acting bronchodilators, our data clearly indicates a fail in reaching asthma patients with respective fundamental changes in therapy [9]. Interestingly, no usable data associating with the COVID-19 pandemic could be retrieved from *Google Trends* regarding maintenance therapy with long-acting beta agonists (LABA) and long-acting antimuscarinics (LAMA), or a combination of both (LABA/LAMA), the latter representing a cornerstone in the prevention of COPD exacerbations and therefore reflecting scarce knowledge about preventive therapeutic approaches within the population affected by COPD.

Although the here presented data will help to understand trending needs of patients with obstructive respiratory disease, we have to acknowledge some limitations. First, *Google Trends* does not provide insights into the characteristics of individuals contributing to search volumes. Second, search volumes may be increased during events or conditions with large media coverage. Finally, in a population with poor knowledge about a disease *Google Trends* might underestimate the *real-world* burden of the investigated conditions *per se*, and therefore our findings will require validation through epidemiologic studies.

In summary, both social distancing and lockdown measures together with increased self-medication and digital care-seeking may have reduced hospital admission rates in patients affected by obstructive respiratory disease during the COVID-19 outbreak in early 2020. However, our data urge further improvement in implementing digital health monitoring and advice in patients affected by asthma and COPD.

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Author's contribution:

SS, AB, AP, TS, MA, GW, JLR, IT conceived and designed the study

SS, AB drafted the manuscript

SS, AB collected the data

SS, AB, AP, JLR, IT analyzed and interpreted the data

SS, AB, AP, TS, MA, GW, JLR, IT revised and approved the manuscript.

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Figure legend

Figure: **(a)** shows daily hospitalization rates for COVID-19 and main respiratory conditions leading to hospital admission at the Department of Internal Medicine, Medical University of Innsbruck, Austria between 2017 and 2020. **(b)** depicts the world-wide RSV of pre-existing conditions with a high risk for a severe course of COVID-19 associating with the term “coronavirus”. **(c)** shows the world-wide RSV of medications used by asthmatics and patients affected by COPD. RSV ranges from 1–100, representing search interest relative to the peak popularity for the used search term. An RSV value of 100 indicates peak popularity and a score of 0 indicates that the term is below 1 percent of its peak popularity.

