ORIGINAL ARTICLE

Search trends for coronavirus, on Google, by the Brazilian population

Tendência de pesquisas sobre coronavírus, no Google, pela população brasileira

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ABSTRACT

The aim of this study was to identify the search trends for coronavirus in Brazil using Google Trends and verify the correlation between the relative volume of searches and the number of confirmed cases. This is a cross-sectional, quantitative study based on Google Trends on the searches performed by the Brazilian population related to the coronavirus pandemic. Searches for the term "coronavirus" began at the end of January 2020, with relative search volume (RSV) ranging from one to six. The maximum volume (RSV = 100) was obtained on March 21 and 22. The increase in the number of confirmed cases coincided with the rise in the relative search volume for "coronavirus". The correlation between the relative search volume and the number of confirmed cases was r = 0.753 (p<0.01). There was a positive and strong correlation between the increase in searches for the term "coronavirus" and the number of confirmed cases of COVID-19.

Descriptors: Coronavirus; Severe Acute Respiratory Syndrome; Pandemics; Internet; Social Networking.

RESUMO

Objetivou-se identificar tendência das pesquisas sobre coronavírus no Brasil por meio da ferramenta Google Trends e verificar a correlação entre o volume de pesquisa relativo e o número de casos confirmados. Estudo transversal, quantitativo, desenvolvido com base em consulta ao Google Trends sobre as buscas realizadas pela população brasileira relacionada à pandemia do coronavírus. As buscas pelo termo "coronavírus" iniciaram-se no final de janeiro de 2020, com volume de pesquisa relativo variando de um a seis. O volume máximo (VPR = 100) foi obtido nos dias 21 e 22 de março. O aumento no número de casos confirmados coincidiu com a elevação do volume de pesquisa relativo para "coronavírus". A correlação entre o volume de pesquisa relativo e o número de casos confirmados foi de r = 0,753 (p<0,01). Houve correlação positiva e forte entre o aumento de buscas pelo termo "coronavírus" e o número de casos confirmados da COVID-19.

Descritores: Coronavirus; Síndrome Respiratória Aguda Grave; Pandemias; Internet; Rede Social.

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INTRODUCTION

At the end of 2019, there was an outbreak of atypical pneumonia in Wuhan, Hubei province, China. The etiological agent detected from this infection was a new type of coronavirus, later called SARS-CoV-2, responsible for the coronavirus disease (COVID-19). On January 30, 2020, the World Health Organization (WHO) announced the outbreak as a public health emergency of global interest and, on March 11, 2020, altered the status to pandemic[1-2].

Between December 08, 2019, and April 1, 2020, 932,605 cases of COVID-19 had been reported worldwide and a total of 46,809 deaths. The countries with the highest number of confirmed cases and deaths, by April 02, respectively, were the United States (213,372 cases) and Italy (13,155 deaths). In the same period, Brazil totaled 6,836 cases and 240 deaths[3].

Numerous efforts have been made by researchers to find effective treatments for COVID-19. It is known that infection has a one to 14-day incubation period and, more frequently, from three to seven days[4]. It may present in a mild form or with no symptoms, but may also cause serious and fatal respiratory diseases[5].

The WHO recommended the following prevention and control measures for cases of suspected COVID-19 infection: screening, early recognition and isolation of patients with suspected disease; application of standard prevention for all patients; implementation of additional precautions for suspected cases, such as droplet and contact; implementation of administrative controls; and use of environmental and engineering controls[6].

In Brazil, with the aim of reducing the spread of the infection and in accordance with the WHO guidelines, the Ministry of Health established the following prevention measures for the general population: frequently wash hands with soap and water or use hand sanitizer; use disposable tissues for nose hygiene; avoid touching the mucous membranes (eyes, ears, mouth, and nose); cover the mouth and nose when sneezing or coughing; avoid crowds; keep rooms ventilated; do not share personal items; and avoid contact with people who exhibit signs and symptoms of infection[7].

Every day, a series of new recommendations is published to prevent the spread of SARS-CoV-2. Thus, the population must have access to reliable information based on scientific evidence about the COVID-19 pandemic. In addition, it should be considered that social media currently exerts a huge influence on the behavior adopted by the population and is an important vehicle for divulging health-related information[8]. In this regard, one way to monitor possible queries of the population on a given subject is technological tools such as Google Trends (GT). This tool can reveal the concerns and queries of the population in relation to a particular subject through the Google search engine, which is the world's largest search platform[9], and signal interventions that can be adopted by authorities through digital media, for example. The hypothesis is that the number of Google searches on a given disease increases as the number of cases and deaths and the consequent disclosure of data by the press increases. Therefore, the present study aimed to identify search trends for coronavirus in Brazil using Google Trends and verify the correlation between the relative volume of searches and the number of confirmed cases.

METHODS

This is a cross-sectional, qualitative study based on GT data (https://trends.google.com.br/trends/?geo=BR) on the queries of the Brazilian population related to the SARS-CoV-2 pandemic. The following terms were used: "coronavirus", "hand washing"; "surgical mask", and "hand sanitizer". The term "coronavirus " was chosen to represent the main form of designation of the new infection suggested by GT in the searches, as well as the most recurrent nomenclature divulged on social media at the beginning of the pandemic. In turn, the last three terms were considered to represent the search for information on personal hygiene practices related to disease transmission prevention, as performed in another study[10].

The established selection period was from January 01 to March 31, 2020. This period was chosen because the first confirmed case in Brazil was disclosed on February 26, 2020[11] and because it marked the start of the pandemic in Brazil. All data were collected on April 01, 2020.
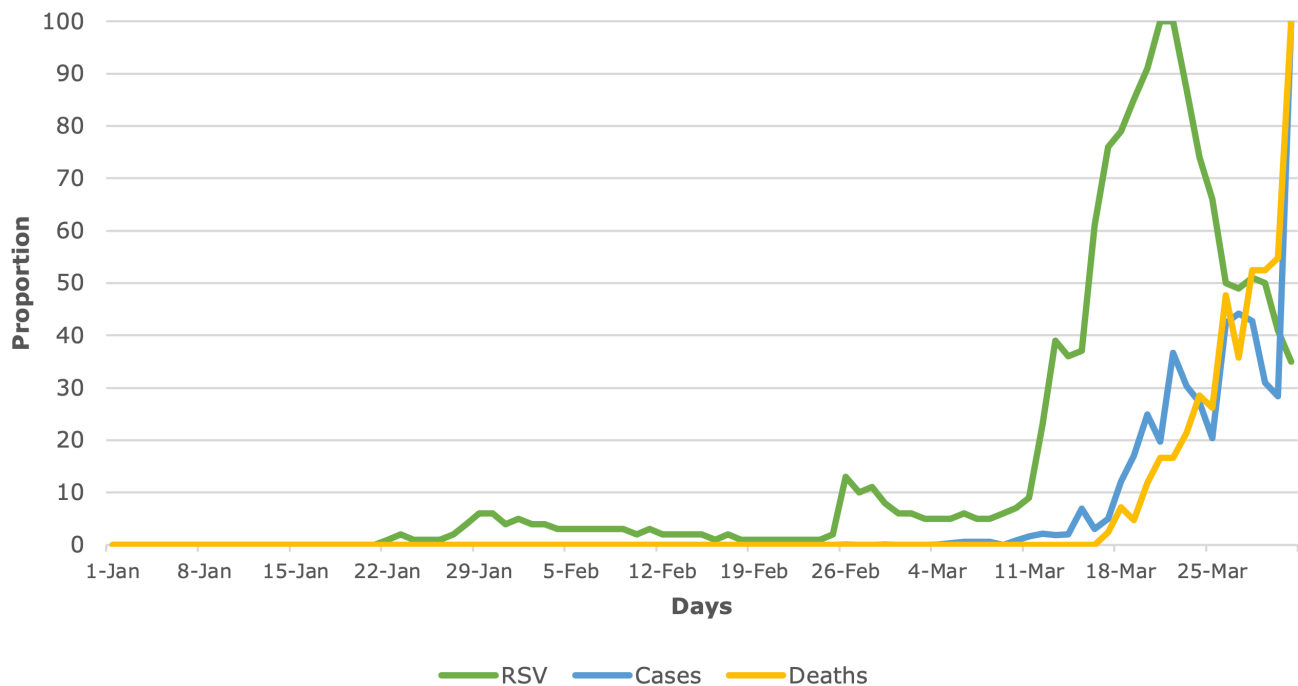
The interest of the Brazilian population on the subject was measured based on the relative search volume (RSV) in the selected period, calculated by GT, where the number 100 represents the peak of popularity on a term, and 50 expresses half of the term's popularity. A score of zero indicates the absence of sufficient searches on the term. The five most popular related queries and the five queries in terms of rising popularity were also considered, when available, regarding the terms mentioned above, according to GT data. The top related queries are those made most frequently and rising queries with are those with the biggest increase in frequency, using the previous period as reference. Both were measured on a scale ranging from zero to 100, as in the case of RSV[9].

The data obtained in GT on the term "coronavirus" were correlated with confirmed cases for COVID-19 in Brazil, obtained at the website https://covid.saude.gov.br/, created by the Brazilian Ministry of Health to monitor cases of infection[11]. The data regarding the number of confirmed cases and deaths were adjusted to be compared with the daily RSV of GT, starting from the first confirmed case, and counted on a scale from zero to 100, with 100 being the day with the highest number of reported cases in the period.

The correlation between RSV (dependent variable) and number of confirmed cases (independent variable) for

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coronavirus in GT was calculated by means of Spearman's correlation coefficient to verify the relationship between the variables studied with reference to two other similar studies[10,12]. This measure ranges from -1 to +1, where -1 indicates perfect negative or inverse correlation, 0 indicates absence of correlation between variables, and 1 indicates perfect positive or direct correlation. The following ranges of values were considered to interpret the Spearman correlation: 0.20 to 0.39 = weak; 0.40 to 0.59 = moderate; 0.60 to 0.79 = strong; and ≥0.80 = very strong[13]. The significance level was $p < 0.05$.

Because this is public domain data, submission of the study to the research ethics committee was not required.

RESULTS

Internet searches for the term "coronavirus" began on January 22, 2020, with a low RSV varying from one to six. This scenario began to change on February 26, 2020, the day the first confirmed case of COVID-19 in Brazil was disclosed (RSV = 13). On March 12, a significant number of searches were observed (RSV=23) and 25 new cases of COVID-19 were disclosed (Figure 1). On March 21 and 22, the maximum volume was reached (RSV = 100). The latter day was marked by 418 new cases and seven deaths in Brazil.

After March 22, there was a decrease in the frequency of searches with the term "coronavirus", which dropped from RSV = 87, on March 23, to RSV = 35 on the last

Data were adjusted proportionally, according to the maximum value obtained in each set.

Figure 1: Trend in the number of cases, deaths, and Google Trends searches related to coronavirus, Brazil, 2020.

day evaluated, March 31, despite the increasing number of new cases and deaths (cases = 1,138 and deaths = 42). The correlation between the RSV and number of cases counted from disclosure of the first case was r = 0.753 (p<0.01). This demonstrated a strong and positive correlation between the variables.

Regarding COVID-19 transmission prevention, "hand sanitizer" was the most frequently used of the three selected terms, with maximum RSV (100) obtained on March 18. In contrast, "hand washing" always presented RSV ≤1 when compared to the other terms. Frequency of the term "surgical mask" also increased, especially between March 12 and 24

(RSV = 4 to 11), when there was an increase in the number of cases and deaths (Figure 2).

Regarding the queries related to the term "coronavirus", the search for information using the terms "coronavirus Brazil" (RSV = 100) and "coronavirus in Brazil" (RSV = 79) was striking. The search for information related to "symptoms" (RSV = 73 and 58) and "coronavirus cases" (RSV = 62) also increased notably. The situation in Italy triggered a sudden increase in searches represented by the term "coronavirus Italy". In regard to "hand washing", the main related query was the term "hand washing Anvisa" (RSV =100). For "surgical mask", a sudden increase in terms related to the manufacture of masks or where to buy them was noted.
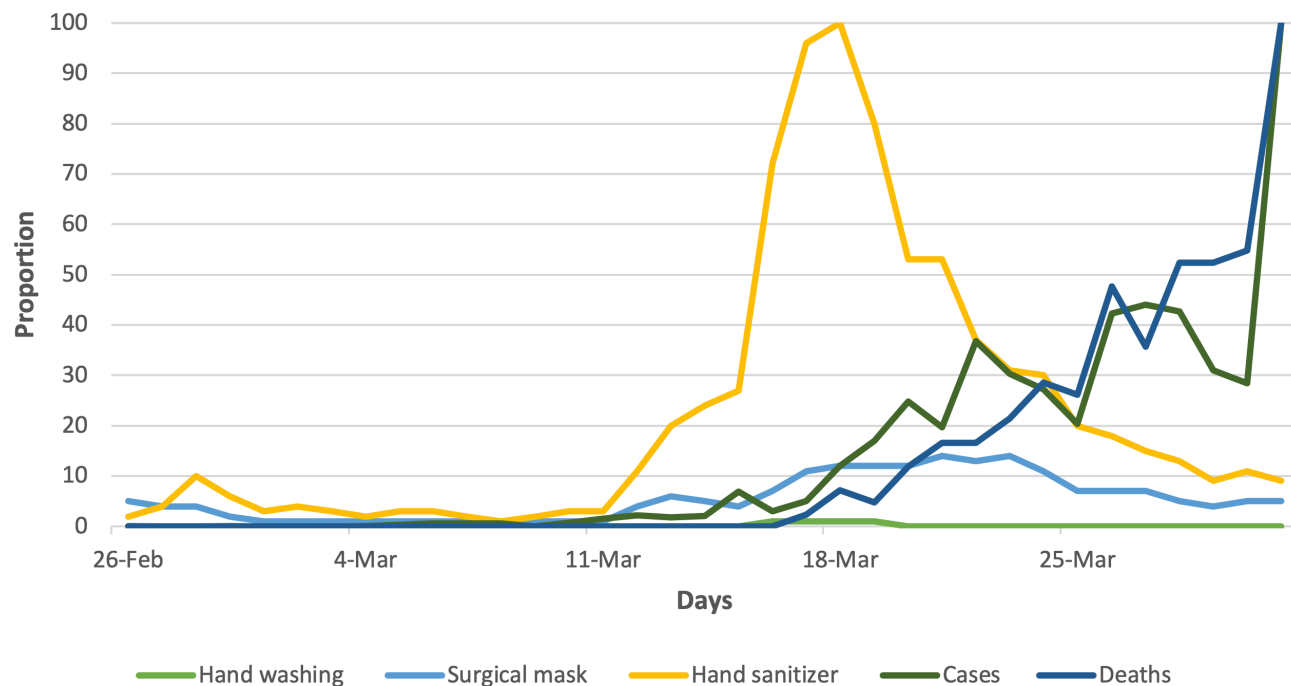
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Data were adjusted proportionally, according to the maximum value obtained in each set.

Figure 2: Tendência drend in the number of cases, deaths, and Google Trends searches related to coronavirus and forms of prevention (hand washing, surgical mask, and hand sanitizer), Brazil, 2020.

Regarding "hand sanitizer", in addition to the synonym "gel hand sanitizer" (RSV =100) and "alcohol 70%" (RSV = 84), searches related to "how to make gel hand sanitizer" (RSV = 34 and 31) were identified. Likewise, a sudden increase was observed for the terms "how to make gel hand sanitizer at home" (Table 1).

DISCUSSION

GT can be considered a digital surveillance tool for monitoring the concerns of the population since the increase in searches was verified approximately one month before the first official record.

This strategy was employed in a study that identified a high correlation between the number of cases four days before confirmation of the first case of Middle East Respiratory Syndrome (MERS-CoV) caused by coronavirus and searches on the subject on Google and Twitter in Korea (r>0.7). Moreover, this finding reveals that this mechanism may be useful for monitoring emerging infectious diseases[12].

The consequent searches carried out by the population on social media, such as those carried out on Google, may reflect the real outbreak of a given disease before epidemiological surveillance identifies its expansion and severity. This is due, in particular, to the fact that many people use internet searches to obtain health information before seeking assistance from a health care professional or specialized service, either because of preference or the existence of some kind of limitation[14-16].

The COVID-19 pandemic may have been the result of several activities that contributed to the spread of SARS-CoV-2. Among these activities is the flow of people, initially between countries, through air transport, and, later, local transmission, in view of the high potential for transmission and permanence of the virus on surfaces. Other factors may have contributed, as in the case of the Republic of Korea in 2015, to a lesser degree, as a consequence of MERS-CoV, such as lack of awareness of health workers and the population about the disease and ineffective measures to contain infection in health institutions[17]. Thus, the internet, in addition to monitoring searches for certain information, can help health authorities provide the population with correct information based on scientific evidence.

Since the first cases of COVID-19, the Brazilian Ministry of Health has sought to inform the population through official websites, television networks, and social media about the nationwide status of the disease regarding symptoms, forms of transmission, and prevention measures[18]. Despite the actions carried out by the respective authorities, searches related to the term "coronavirus" were naturally associated with the infection situation in Brazil and the symptoms, which are causes for concern of the general population.

The sudden increase in internet searches associated with the situation in Italy reflected the fact that the scenario was more

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Table 1. Queries related to increased searches in Google Trends related to the terms coronavirus, hand washing, surgical mask, and hand sanitizer, Brazil, 2020.

TERMS	RELATED QUERIES	RSV*	INCREASE IN SEARCHES
Coronavirus	coronavirus Brazil	100	1. coronavirus in Italy
	coronavirus in Brazil	79	2. coronavirus Brazil today
	coronavirus symptoms	73	3. coronavirus in São Paulo
	coronavirus cases	62	4. coronavirus in Brazil confirmed cases
	symptoms of coronavirus	58	5. coronavirus deaths in Brazil
Hand washing	hand washing Anvisa	100	1. correct hand washing†
	step-by-step hand washing	75	
	correct hand washing	74	
	moments of hand washing	36	
	hand washing technique	25	
Surgical mask	mask	100	1. make surgical mask
	surgical mask	87	2. how to make surgical mask
	disposable mask	34	3. mask pattern
	disposable surgical mask	33	4. where to buy surgical masks
	mask	28	5. disposable masks
Hand sanitizer	gel hand sanitizer	100	1. hand sanitizer buy
	alcohol 70	84	2. how to make hand sanitizer at home
	hand sanitizer 70	84	3. make hand sanitizer at home
	make hand sanitizer	34	4. buy gel hand sanitizer
	how to make hand sanitizer	31	5. alcohol 70 buy

* RSV= relative search volume; †term only had one query with a sudden increase.

dramatic in Italy in the search period of this study, be it in the number of deaths, more than 13,000, especially among the elderly, or in regard to the difficulties faced by health workers and services[3,19]. In general, these patients had underlying diseases such as diabetes, cancer, cardiovascular problems, and a history of smoking. However, it should be noted that they developed pneumonia due to acute respiratory distress syndrome associated with COVID-19, with the consequent need for ventilatory support and intensive care[20].

The challenges initially faced in Italy and the measures that were or were not adopted served as support for other countries worldwide, within the time available and scope of national policies, to prepare or begin to prepare their health care services.

Regarding the personal hygiene practices recommended worldwide and adopted by Brazil, hand washing with soap and water was widely publicized as a way to prevent COVID-19, followed by the use of hand sanitizer when hand washing was not possible. This is due to the fact that when people infected with COVID-19 cough, they release droplets of infected fluid that can adhere to surfaces and objects. Thus, other people may become infected when they touch these surfaces or objects and subsequently touch their eyes, mouth, or nose[7,21].

In the present study, however, hand washing accounted for a low number of Google searches compared to the other measures. Because hand washing is a routine practice, it may not have been considered important in the prevention of SARS-CoV-2, although it is one of the most effective prevention strategies to be adopted by the population[22].

The greatest number of searches was for hand sanitizer, reflected in an unbridled race to pharmacies and supermarkets to purchase the product. As a result, within a few days hand sanitizer disappeared from the shelves of pharmacies and supermarkets, it became very costly, and it was in short supply in health care institutions. Moreover, many people searched for information on how to make hand sanitizer at home. This search was worrying since alcohol-based hand sanitizer should only be produced by professionals and specialized institutions due to the risk of accidents and consequent health hazards.

A similar situation was identified in a study that evaluated Google search trends for COVID-19 in Taiwan. The authors noticed a rapid increase in searches on masks after the announcement of the first imported case of COVID-19.

In contrast, searches on hand washing increased gradually, triggered by the scarcity of masks in the domestic market[10].

On the use of masks by the population, the WHO initially recommended that healthy people did not need to use surgical masks. However, if a healthy individual was caring for a person with suspected COVID-19, use of face masks was recommended. Face masks should also be used when the individual is coughing or sneezing and is only considered effective when associated with frequent hand washing[23].

One of the reasons the widespread use of surgical masks was discouraged was to ensure they were readily available and in supply for health care workers. At the time, scientific evidence on the subject was still scarce, which hindered a broad-scale recommendation to the entire population. However, the rational use of masks would be reasonable for vulnerable individuals exposed in areas with a high risk of contamination[24].

On April 01, the Brazilian minister of health recommended that anyone could make homemade masks from fabric as a barrier against coronavirus. This recommendation was ratified with an informative notice, with the following types of fabric being recommended for manufacturing masks: vacuum bag fabric; cotton in the following composition: polyester (55%) and cotton (45%); 100% cotton fabric; and antimicrobial fabric pillowcases[25].

The limitations of this study are the use of Google alone, the non-observance of nomenclature variations for searches on the same subject (coronavirus, novel coronavirus, COVID-19, SARS-CoV-2), and the time period, which does not portray the real scenario of searches in the peak of the pandemic in Brazil. Moreover, the regional scenarios were not analyzed, per federal unit, and there may be variations within the national territory. Furthermore, searches for a particular subject may have been influenced by news broadcasts in different communication media.

CONCLUSION

In this study, it was found that the searches carried out by the Brazilian population on Google for the term "coronavirus" increased as the number of cases and deaths began to be recorded across the country.

In addition, it was found that searches using the terms "surgical mask" and "hand sanitizer" increased in this initial period of the pandemic as measures to prevent the transmission of COVID-19. "Hand washing", however, was the least sought-after term among those evaluated. Hand washing is a simple prevention measure that needs to be more emphasized in the social mobilization policy, in advertising, and in social media.

The findings of the present study consider the search function as a means to monitor the concerns of the population regarding COVID-19 and, subsequently, support the planning of strategies to reduce transmission of the virus, especially with regard to correct forms of prevention based on scientific evidence.

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