"Dr. Google, I Have a Toothache"- Assessment of the Impact of COVID-19 Pandemic on Toothache-Related Internet Searches with Google Trends

"Dr. Google, Diş Ağrım Var"- COVID-19 Pandemisinin Diş Ağrısıyla İlgili İnternet Aramalarına Etkisinin Google Trends Verileri ile Değerlendirilmesi

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ABSTRACT

Objective: To evaluate the relationship between online searches for the term toothache and the COVID-19 pandemic in Türkiye by using Google Trends (GT) data.

Methods: GT search was performed for the term "toothache" (in Turkish) for the period from March 03, 2019, to May 28, 2022, across Türkiye, and relative search volumes (RSV) per week were recorded. The dates between March 03, 2019-March 07, 2020 were considered as the pre-pandemic period, and between March 08, 2020-May 28, 2022 were considered as the pandemic period. The pandemic period was further divided into three groups; the early period, the full lockdown period, and the other weeks during the pandemic period. The mean RSV values of the pre-pandemic and pandemic periods were compared, and the relationship between the mean RSV values of pandemic period groups was also examined. The correlation between the number of COVID-19 cases and the RSV was analyzed. The statistical significance level was accepted as P <.05.

Results: The mean RSV was significantly lower in the pre-pandemic period (62.96±9.98) than in the pandemic period (67.52±11.51) (P <.05). In the early pandemic period group, higher mean RSV was determined than other groups (P<.001). A negative correlation was found between the number of cases and RSV (r= -0.203, P <.05).

Conclusion: Online searches for the term toothache increased during COVID-19 pandemic in Türkiye. Understanding the search trends in online media is critical to determine the interests and needs of the people regarding diseases and to provide the necessary information.

Keywords: COVID-19, internet, toothache

ÖZ

Amaç: Google Trends (GT) verilerini kullanarak Türkiye'de diş ağrısı terimi için yapılan çevrimiçi aramalar ile COVID-19 pandemisi arasındaki ilişkinin değerlendirilmesi.

Yöntemler: Türkiye genelinde 03 Mart 2019-28 Mayıs 2022 arası periyotta "diş ağrısı" terimi için GT araması yapıldı ve haftalık göreli arama hacmi (GAH) değerleri kaydedildi. 03 Mart 2019-07 Mart 2020 arası pandemi öncesi dönem, 08 Mart 2020-28 Mayıs 2022 arası pandemi dönemi olarak belirlendi. Pandemi dönemi; erken dönem, tam kapanma dönemi ve pandemi dönemindeki diğer haftalar olmak üzere üç gruba ayrıldı. Pandemi öncesi ve pandemi dönemlerinin ortalama GAH değerleri karşılaştırıldı ve ayrıca pandemi dönemi gruplarının ortalama GAH değerleri arasındaki ilişki incelendi. COVID-19 vaka sayısı ile GAH arasındaki korelasyon analiz edildi. İstatistiksel olarak anlamlılık düzeyi P <,05 olarak kabul edildi.

Bulgular: Ortalama GAH pandemi öncesi dönemde (62,96±9,98) pandemi dönemine (67,52±11,51) göre anlamlı derecede daha düşük bulundu (P <,05). Erken dönem grubunda, diğer gruplara göre daha yüksek ortalama GAH tespit edildi (P <,001). Vaka sayıları ile GAH arasında negatif korelasyon bulundu (r= -0,203; P <,05).

Sonuç: Bu çalışmanın bulguları Türkiye'de COVID-19 pandemisinde diş ağrısı terimi ile yapılan çevrimiçi aramaların arttığını göstermektedir. Çevrimiçi medyada yapılan arama sonuçlarının değerlendirilmesi, insanların hastalıklara olan ilgilerini ve ihtiyaçlarını belirlemek, gerekli bilgilendirmeleri yapmak için önemlidir.

Anahtar Kelimeler: COVID-19, diş ağrısı, internet

INTRODUCTION

In December 2019, several people in Wuhan, China, presented with symptoms of pneumonia of unknown etiology.[1,2] The World Health Organization (WHO) identified the cause of these symptoms as a novel coronavirus and named the illness Coronavirus Disease-2019 (COVID-19). The WHO declared a pandemic on March 11, 2020, due to the rapid global spread of the disease.[1] The first official COVID-19 case in Türkiye was reported on March 11, 2020.[3]

COVID-19 is transmitted between individuals through respiratory secretions, including coughing, sneezing, and inhaling droplets, or direct contact with the mucous membranes in the mouth, nose, and eyes.[4] Dentists are at particularly high risk for COVID-19 infection due to the aerosol generated during dental procedures, working in close proximity to patients, and extended treatment duration. During the COVID-19 pandemic, dental clinics presented a risk of spreading the virus.[4] For these reasons, routine dental practices were suspended in many countries during the COVID-19 pandemic, and treatments were carried out in line with the guidelines established by ministries of health and professional organizations.[5] In Türkiye, many precautions have been taken to reduce the spread of the virus.[6] Essential precautions and protocols for dental treatments were determined and it was recommended to postpone dental treatments that were not classified as emergency or compulsory services.[7]

Every day, many users around the world search for information on the internet using online search engines. These searches provide a large amount of data about the general population in real-time. This data can be used to assess the interest and tendency of the society in a particular issue. The most widely used search engine today is Google.[8] Google Trends (GT) is a free, publicly available application that analyzes searches on Google over a given period and provides an assessment of global or regional search intensity.[9] The data provided by GT have proven valuable for analyzing human behavior in the context of health.[10]

During the COVID-19 pandemic, there has been a decrease in dental visits.[11] Guo et al.[12] reported a 38% decrease in patients visiting emergency dental centers at the beginning of the pandemic compared to an earlier period. The reasons for a decrease in dental visits may include restrictions, limited access to health facilities, and fear of contamination. Rizzato et al.[13] highlighted that during the pandemic period, patients turned to the online environment to learn about the diagnosis and treatment methods of toothache. The aim of this study is to evaluate the relationship between online searches with the term "toothache" (in the official language of Türkiye: "diş ağrısı") in Türkiye and the COVID-19 pandemic using GT data. The null hypothesis was that the frequency of online searches for toothache remained unchanged during the COVID-19 pandemic.

METHODS

The GT presents the number of online searches for a given search query as a relative search volume (RSV) with a value between 0 and 100. A value of 100 for RSV indicates the highest search activity for that search query in the specified period. A value of 0 indicates low search activity that does not affect the results; it does not imply that no queries were made. GT does not evaluate repeated queries from the same internet protocol (IP) address within a short period.[14] The use of quotation marks (" ") when writing search terms is important for a meaningful and systematic search volume.[14,15]

This study was exempt from ethical approval since publicly available online data were used. In this study, a GT search was conducted across Türkiye for the term "diş ağrısı", which means toothache in the official language of Türkiye, from March 3, 2019, to May 28, 2022, and weekly RSV values were recorded. In our study, we defined between March 3, 2019, and March 7, 2020, as the pre-pandemic period, and between March 8, 2020, and May 28, 2022 as the pandemic period. The pandemic period was divided into three groups: G1, the early period (weeks between March 8 and May 30, 2020); G2, the full lockdown period in Türkiye (weeks between April 25 and May 15, 2021); and G3, other weeks during the pandemic period (weeks between May 31, 2020, and April 24, 2021, and May 16, 2021, and May 28, 2022). The number of weekly COVID-19 cases in Türkiye between March 11, 2020, and May 28, 2022, was calculated using the daily data published on the official website of the Republic of Türkiye Ministry of Health, and the correlation between the number of weekly COVID-19 cases and the RSV was examined.

Statistical Analysis

Statistical calculations were performed using SPSS (Statistical Package for the Social Sciences) version 22.0 (IBM SPSS Corp.; Armonk, NY, USA) statistical program. The Mann-Whitney U test was used for pairwise comparisons. Group comparisons were performed using the Kruskal-Wallis test, and Mann-Whitney U tests with Bonferroni correction served as post hoc tests. The correlation between the number of weekly COVID-19 cases and RSV values was determined with the Spearman correlation coefficient. The significance level for the research findings was set at $P < .05$.

RESULTS

RSV data and the number of weekly COVID-19 cases for the defined periods and groups are presented in Figure 1. The highest RSV value was recorded during the week of April 19-25, 2020, in the G1 group.
In this study, a statistically significant difference was identified in the mean RSV between the pre-pandemic and pandemic periods ($P < .05$) (Table 1). In the pandemic period, the mean RSV was higher in the G1 group than in the G2 and G3 groups ($P < .001$) (Table 2). A negative correlation was observed between the number of cases and RSV during the pandemic period (r=-0.203, $P<.05$).

Table 1. Comparison of mean RSV values pre-pandemic and pandemic periods

|	n	Mean±SD	Minimum	Maximum	P*
Pre-pandemic Period	53	62.96±9.98	46	91	.01
Pandemic Period	116	67.52±11.51	46	100	

*Mann-Whitney U Test, $P<.05$. n: Number of weeks

Table 2. Comparison of mean RSV values of pandemic period groups

	n	Mean±SD	Minimum	Maximum	p*
G1	12	86.67[a]±13.60	60	100	<.001
G2	4	67.75[ab]±6.65	61	76	
G3	100	65.21[b]±9.07	46	95	

*Kruskal-Wallis Test, $P<.001$. n: Number of weeks
Different superscripts a and b indicate statistically significant differences between groups
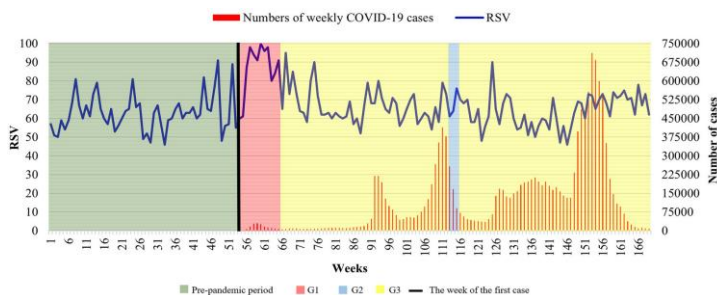
Figure 1. RSV values for the term "toothache", and numbers of weekly COVID-19 cases.

DISCUSSION

GT data are used to analyze various fields, such as medicine, health, business and economics, information technology, and communications.[16] In the health field, GT data can be used to analyze societal tendencies, correlations and to make predictions for the future, related to diseases.[17] In this study, we used GT data to evaluate the impact of the COVID-19 pandemic on online searches related to toothache. It was found that the mean RSV in the pandemic period was higher than in the pre-pandemic period. As a result, the null hypothesis was rejected.

Kamiński et al.[8] conducted a study analyzing searches for 24 different pain terms on Google worldwide between 2004 and 2019. The study found that headache, abdominal pain, and back pain were the top three searched terms, respectively, while toothache ranked ninth. Szilagyi et al.[18] conducted a Google Trends analysis of 24 different pain terms between January 1, 2018, and December 31, 2020, in six of the world's most populous regions. They found a significant increase in search queries for back pain, breast pain, chest pain, ear pain, headache, odynophagia, neck pain, shoulder pain, sore throat, testicular pain, toothache, and wrist pain after the first confirmed COVID-19 case. A study conducted in Iran found that during the COVID-19 pandemic lockdown, the search term toothache had a statistically higher RSV value than the four-year period before the pandemic.[19] The RSV values for the search term toothache were analyzed in 21 different countries, including Türkiye, between May 2018 and April 2020, and it was reported that the search volume increased in all countries except Japan after the implementation of restriction measures.[13] A study was conducted to examine the RSV values of the term toothache in English searched worldwide between January 1 and August 23, 2020. The highest value was recorded on April 12, 2020, which was the date after the start of pandemic restrictions in most countries.[11] Our study found that the mean RSV for searches containing the term "toothache" in Turkish was higher during the pandemic period than in the pre-pandemic period. The highest value was recorded during the week of April 19-25, 2020. These results are consistent with the literature.

The present study, found higher mean RSV in the early period compared with the full lockdown period and other weeks during the pandemic period. The fact that the transmission routes, course, treatment, and prevention methods of COVID-19 and temporary or permanent damage to people infected with the virus were not fully known in the early period of the pandemic might caused unease in society. We believe that individuals who were unable to access dental health services due to the restrictions imposed, who had not received, or delayed necessary dental treatment voluntarily, may turn to online searches for information on diagnosis and treatment methods. With the increase in knowledge about COVID-19, protocols for dental treatments have been established, and thus, access to dental health services has increased. This could explain why we found a higher RSV average in the early pandemic period.

During the pandemic, thousands of people were confined to their homes, and social restrictions were imposed, resulting in more time spent searching for information on the internet and social media.[13] In the early months of the pandemic, knowledge of COVID-19 symptoms was limited. This may have led some people to associate toothache with the COVID-19.[13] The presence of mucosal lesions and periodontal disease, thought to be associated with COVID-19[20] might have led to neglect of necessary oral care procedures, subsequently negatively affecting oral health and potentially leading to dental problems. Restrictions and fear of transmission may have discouraged patients from visiting dentists and encouraged them to seek information online.

Internet use is becoming more widespread every year.[21] For this reason, the last year before March 2020, when the first case was seen in Türkiye, was evaluated as the pre-pandemic period for data comparison in this study.

This study has several limitations. While GT has been used in many research publications, there are no agreed standards for its use. However, many studies lack thorough documentation of search methodologies, preventing results's reproducibility. In healthcare research, the reliability of data in GT is variable and limited due to the lack of provided reasons for searches on Google.[15] GT analysis only uses search data from the Google search engine; data from other search engines and social media platforms are not included. Age and gender may affect internet use. Demographic information of individuals searching on the internet cannot be obtained. According to the Survey on Information and Communication Technology Usage in Households and by Individuals conducted by the Turkish Statistical Institute, the internet usage rates of individuals by age group and gender in the last three months of 2022 were evaluated; the highest rate was reported in the 25-34 age group with 96.5% (male: 97.8%; female: 95.2%) and the lowest rate was reported in the 65-74 age group with 36.6% (male: 43.8%; female: 30.3%).[22] Our study does not represent the entire population of Türkiye as it does not include individuals living in regions without internet access. Finally, this study used only one search term in its official language form in Türkiye. It is recommended that further studies be conducted using various search terms related to pain in dentistry.

Evaluating online health search results is important to determine people's interests and needs regarding diseases and to provide the necessary information. As a result of this study, it was observed that online searches for the term toothache (in Turkish) increased during the COVID-19 pandemic in Türkiye. Analyzing these search results can play a guiding role in planning and managing local or regional health policies in Türkiye.

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