Original Research

The Evaluation of Cardiovascular Surgery-Associated Google Search Trends During COVID-19 Waves

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Abstract

Objectives: The aim of the study was to clarify public interest about cardiovascular disease during the COVID-19 pandemic using Google Trends (GT).

Methods: The study was performed between November 20 and December 1, 2021. A total of 21 keywords related to cardiovascular surgery were selected. Public attention to all selected keywords was analyzed by GT with using the filters "web search," "all categories," and "Turkey." In Turkey, three COVID-19 waves (between March 12, 2020, and May 8, 2020, November 24, 2020, and January 20, 2021, and March 20, 2021, and May 16, 2021) were experienced since the beginning of the pandemic. To analyze public attention to cardiovascular surgery during the COVID-19 waves, 8-week periods during the COVID-19 waves were compared with the same times in the past 4 years (2016–2019).

Results: Comparisons of March 12–May 8 2020 and the same period between 2016 and 2019 showed that total public interest about cardiovascular surgery was significantly decreased (−28.7%, p=0.001). The comparison of the second COVID-19 wave (November 24, 2020–January 20, 2021 versus November 24-January 20, 2016–2019) revealed that public interest about cardiovascular surgery was significantly lower in the COVID-19 era (−22.2%, p=0.001). Comparison of the third COVID-19 wave and the same periods in the previous 4 years demonstrated that public interest about cardiovascular disease was significantly lower in the COVID-19 era (−8.5%, p=0.001). In contrast, the term coronary angiography was searched significantly more during the third wave of COVID-19 in comparison to the same periods between 2016 and 2019 (17.9%, p=0.015).

Conclusion: Our study demonstrated that public interest in cardiovascular diseases was significantly decreased in all waves of the COVID-19 pandemic. However, interest in only the term coronary angiography was significantly increased in the third wave of pandemic.

Keywords: Cardiovascular surgery, COVID-19, Google trends, pandemic, public interest

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The new coronavirus infection (COVID-19) was first diagnosed in December 2019, and COVID-19 spread to all around the world in a few months. Although COVID-19 mostly causes symptoms similar to the common cold and flu, it is associated with several complications such as acute respiratory syndrome, heart failure, and chronic kidney disease.[1] Almost 265 million people have been infected by COVID-19 and 5.3 million individuals have died due to COVID-19.[2] After COVID-19 was recognized as a pandemic by the World Health Organization, numerous

prevention rules including social isolation, limitations for travel, and quarantine were announced. Moreover, professional health care workers started to work in intensive care units, COVID-19 wards, and clinics. Furthermore, outpatient clinics in different medical disciplines were closed and surgical procedures were postponed. Due to the impossibility in accessing the health system, many individuals attempted to get information about their disease from other sources including the internet, social media, and television.[3]

Search engines are used to search for content on the internet. Today, numerous search engines are available in practice. However, Google Search (Google Inc. Mountain View, California, USA) is the most commonly used and almost nine out of ten internet users prefer Google Search to get information on the internet.[4] Google Trends (GT) is relatively new Google application to obtain data about how often a word or phrase is inquired about, in which country and in which language.[5] Previously, Teng et al. used GT to evaluate public attention about Zika virus, and the authors stated that GT provided valuable information about this epidemic.[6] In another study by Sevgili and Baytaroglu, they stated that public attention about cardiac diseases significantly decreased at the beginning of the COVID-19 pandemic.[7]

Although public attention about different medical disciplines during COVID-19 was analyzed in different studies using GT, there is no study which analyzes public interest in cardiovascular surgery during the pandemic. In the present study, we aimed to clarify public interest about cardiovascular disease during the COVID-19 pandemic.

Methods

The study was performed between November 20, and December 1, 2021. A total of 21 keywords (coronary bypass, varices, coronary angiography, aortic aneurysm, Buerger's disease, atherosclerosis, open heart surgery, coumadin, international normalized ratio (INR), aortic valve surgery, heart valve surgery, atrial septal defect (ASD), ventricular septal defect (VSD), tetralogy of Fallot (TOF), aortic aneurysm surgery, peripheral vascular occlusion, carotid surgery, carotid artery occlusion venous insufficiency, arteriovenous (AV)-fistula creation, and heart tumor) related to cardiovascular surgery were selected. Public attention to all selected keywords was analyzed by GT with using the filters "web search," "all categories," and "Turkey." The study was planned in accordance with the Helsinki Declaration Principles. Ethical license was not required as the study included internet search data analysis of surgical terms.

Google Trends

GT is a way to obtain data about any keyword among analogous terms from all searches done using Google search in a certain time period. Moreover, GT gives data about the most attractive terms and subjects to make decisions before creating internet content. The outcomes of internet inquiries can be achieved and recorded from the GT official website (https://trends.google.com). For any term, the score on GT is recorded from 0 to 100 (lowest to highest) and a higher GT score is associated with higher public interest.

In Turkey, three COVID-19 waves (between March 12, 2020, and May 8, 2020, November 24, 2020, and January 20, 2021, and March 20, 2021, and May 16, 2021) were experienced since the beginning of the pandemic. To analyze public attention to cardiovascular surgery during the COVID-19 waves, 8-week periods during the COVID-19 waves were compared with the same times in the past 4 years (2016–2019). In the present study, no patient data were used and as a result, the Institutional Ethics committee approval was not required.

For the present study, IBM SPSS v.20 was used for statistical analyses. To evaluate continuous parameters, arithmetic mean±standard deviations were chosen. The Kolmogorov–Smirnov test was done to define the normality assumption. To present differences between groups, the Wilcoxon test and paired samples t test were performed. Statistical significance was accepted as $p<0.05$.

Results

Comparisons of March 12–May 8, 2020 and the same period between 2016 and 2019 showed that total public interest about cardiovascular surgery was significantly decreased (−28.7%, p=0.001). Searches for 16 of 21 terms including coronary bypass, varices, aortic aneurysm, atherosclerosis, open heart surgery, coumadin, aortic valve surgery, heart valve surgery, ASD, TOF, aortic aneurysm surgery, carotid surgery, carotid artery occlusion venous insufficiency, AV-fistula creation, and heart tumor were significantly decreased in comparison to the same period between 2016 and 2019. Inquiries for keywords including coronary angiography, Buerger's disease, INR, VSD, and peripheral vascular occlusion were comparable during the three COVID-19 waves and the previous 4 years.

The comparison of the second COVID-19 wave (November 24, 2020–January 20, 2021 versus November 24,-January 20, 2016–2019) revealed that public interest about cardiovascular surgery was significantly lower in the COVID-19 era (−22.2%, p=0.001). For a total of ten terms including coronary bypass (−26.5%, p=0.001), aortic aneurysm (−42.2%,

p=0.001), atherosclerosis (−36.3%, p=0.001), coumadin (−40.5%, p=0.001), hearth valve surgery (−32.7%, p=0.001), TOF (−32.6%, p=0.001), carotid artery occlusion (−53.9%, p=0.001), venous insufficiency (−34.9%, p=0.001), AV fistula creation (−28.4%, p=0.001), and heart tumor (−34.1%, p=0.001), there were significantly lower inquiries during the COVID-19 era. However, inquiries about the remaining 11 keywords were similar during the second COVID-19 wave and the previous 4 years (Table 1).

Comparison of the third COVID-19 wave and the same periods in the previous 4 years demonstrated that public interest about cardiovascular disease was significantly lower in the COVID-19 era (−8.5%, p=0.001). However, only eight terms (coronary bypass, aortic aneurysm, Coumadin, hearth valve surgery, TOF, carotid artery occlusion, AV-fistula creation, and hearth tumor) received significantly lower public attention. In addition, inquiries about ten terms were comparable between March 20–May 16, 2021 and March 20–May 16, 2016–2019. In contrast, the term coronary angiography was searched significantly more during the third wave of COVID-19 in comparison to the same periods between 2016 and 2019 (17.9%, p=0.015) (Table 1).

Discussion

The internet has become an important information source for patients and patient relatives in the past decades. The previous studies demonstrated that more than 50% of the population use Google to obtain information about any issue.[5] In addition, COVID-19 made it difficult to access the professional healthcare system, and thus more individuals attempted to get information from the internet. In this study, we tried to clarify public interest about cardiovascular surgery during the COVID-19 waves using GT. Public interest in cardiovascular surgery was significantly decreased during all three waves. However, interest in the term coronary angiography was significantly increased during the third wave of COVID-19.

The previous studies investigated the differences in public attention to several medical disciplines between the COVID-19 era and pre-COVID-19 period. Guzman et al. analyzed the public interest in dermatologic diseases and stated that public interest about dermatology was significantly decreased in the 1st days of COVID-19.[8] In another study, Kardes and colleagues investigated the public attention to rheumatologic disorders in the COVID-19 era, and the authors found a significant reduction in public interest about rheumatologic disorders in the 1st month of the pandemic.[9] However, the aforementioned studies stated that public interest about dermatologic and rheu-

matologic diseases reached pre-COVID-19 levels after 15 days and 6 weeks. In the present study, we found a significant decline in public interest about cardiovascular disease during all three COVID-19 waves. Examining the peak period of COVID-19 cases may have led to these results.

Every keyword has a particular search number according to Google search.[10] In the present study, we found that only public interest about coronary angiography was significantly higher in the third wave of the COVID-19 pandemic in comparison to the same period in the pre-COVID-19 era. We have two explanations for this outcome. First, coronary artery disease is one of the most common cardiovascular diseases all around the world and the incidence of coronary artery disease is significantly higher than other diseases such as heath tumor, AV-fistula, and TOF. Second, coronary angiography is more likely to be known by individuals than other specific keywords such as ASD, VSD, and TOF.

Late diagnosis and late treatment of cardiovascular disease could result in progression of the disease, and increased morbidity and mortality rate. Waldstein et al. stated that misdiagnosis of hypertension negatively affected cognitive brain functions.[11] In addition, McKinley and colleagues found that late diagnosis of cardiac disease was related to worse post-procedural outcomes.[12] Nevertheless, no study investigated the influence of COVID-19 on diagnosis and treatment of cardiovascular diseases, which may be a subject for further studies.

Although our study is the first to evaluate public attention to cardiovascular terms by using GT, the present study has some limitations. First of all, many different search engines are available. We used Google in the present study because Google was most frequently used search engine with 90% ratio. Second, we only included terms in the Turkish language. We believe that analyzing more than one language would be complicated. Furthermore, we analyzed only the name and treatment modalities in cardiovascular surgery, not the complaints of patients which could be investigated in further studies.

Conclusion

In conclusion, our study demonstrated that public interest in cardiovascular diseases was significantly decreased in all waves of the COVID-19 pandemic. However, interest in only the term coronary angiography was significantly increased in the third wave of pandemic. We believe that impact of COVID-19 on diagnosis and management of cardiovascular diseases may be clarified in further studies.

Table 1. Comparison of Google trend statistics and results by COVID-19 pandemic periods

	First Wave (March 12–May 8)				Second Wave (November 24–January 20)				Third Wave (March 20–May 16)			
	2020	2016–2019	% change	p	2020	2016–2019	% change	p	2021	2016–2019	% change	p
Coronary Bypass	52.2±11.2	78.1±12.5	−33.2	0.001	55.2±11.5	75.1±10.1	−26.5	0.001	63.2±6.5	65.7±11.3	−3.8	0.001
Varices	49.7±11.5	61.6±12.6	−19.3	0.001	52.2±8.7	55.3±9.5	−5.6	0.127	16.9±3.5	16.2±3.7	4.3	0.465
Angiography	33.4±12.4	35.6±12.8	−6.2	0.170	24.7±11.4	26.4±11.7	−6.4	0.652	52.7±11.9	44.7±16.4	17.9	0.015
Coronary angiography	41.7±12.1	68.3±8.5	−38.9	0.001	44.6±4.2	77.2±10.3	−42.2	0.001	56.2±7.5	70.0±10.7	−19.7	0.001
Buerger's disease	15.3±7.8	19.2±7.6	−20.3	0.367	17.2±7.3	18.1±7.2	−5.0	0.763	21.4±8.3	22.5±7.3	−0.4	0.867
Atherosclerosis	31.8±7.9	51.4±11.7	−38.1	0.001	44.7±9.3	70.2±14.5	−36.3	0.001	50.3±16.6	52.5±13.7	−4.2	0.612
Open heart surgery	31.4±8.7	40.8±10.9	−23.0	0.008	28.1±9.1	31.9±11.8	−11.9	0.476	28.7±8.5	31.4±13.4	−8.6	0.235
Coumadin	31.2±10.2	53.7±13.5	−41.9	0.001	32.9±8.9	55.3±12.3	−40.5	0.001	43.9±8.3	53.6±12.5	−18.1	0.001
INR	31.9±12.7	36.7±14.2	−13.1	0.102	33.4±14.5	42.4±18.8	−21.2	0.076	30.7±10.7	30.3±15.3	1.3	0.920
Aortic valve surgery	29.3±7.9	38.0±13.4	−22.9	0.001	47.5±8.5	49.3±10.3	−3.6	0.349	50.4±15.9	52.1±13.6	−3.3	0.612
Heart valve surgery	21.2±7.4	33.2±12.7	−36.1	0.001	21.6±11.6	32.1±11.9	−32.7	0.001	26.5±14.4	36.2±14.5	−26.8	0.001
ASD	28.2±11.8	39.0±13.6	−27.7	0.002	46.3±9.7	48.8±11.9	−5.1	0.339	48.6±14.9	50.2±11.8	−3.2	0.616
VSD	32.9±12.4	34.5±12.7	−4.6	0.170	14.7±8.4	16.4±6.7	−10.4	0.252	50.7±11.9	46.7±14.4	8.5	0.234
TOF	31.7±4.1	52.6±11.1	−39.7	0.001	31.9±6.7	47.3±7.6	−32.6	0.001	50.1±6.1	62.1±8.7	−19.3	0.001
Aortic aneurysm surgery	13.2±5.4	31.4±10.1	−58.0	0.001	24.5±12.5	29.8±16.7	−17.8	0.107	38.8±12.7	40.2±19.5	−3.5	0.712
Peripheral vascular occlusion	19.7±6.7	20.2±7.4	−2.5	0.639	16.2±2.4	17.6±11.2	−7.9	0.786	24.9±6.8	25.9±6.8	−3.9	0.857
Carotid surgery	23.2±8.8	31.2±10.4	−25.6	0.002	27.3±8.2	30.2±9.2	−9.6	0.176	28.7±9.3	31.3±12.9	−8.3	0.586
Carotid artery occlusion	19.6±6.1	40.2±11.7	−51.2	0.001	21.5±5.8	46.7±11.4	−53.9	0.001	32.9±8.7	48.7±16.4	−32.4	0.001
Venous insufficiency	27.9±6.3	46.5±9.2	−40.0	0.001	42.7±6.3	65.6±11.2	−34.9	0.001	54.6±5.7	58.5±8.1	−6.7	0.312
AV-fistula creation	28.1±9.4	33.5±11.6	−16.1	0.002	22.4±11.6	31.3±12.6	−28.4	0.005	26.7±14.8	37.2±15.5	−28.2	0.001
Heart tumor	32.7±5.1	58.7±9.1	−44.3	0.001	32.7±4.8	49.6±8.7	−34.1	0.001	50.0±6.1	62.8±8.7	−20.4	0.001
Total	29.8±8.8	43.0±11.2	−28.7	0.001	32.5±8.6	43.6±11.1	−22.2	0.001	40.3±9.9	44.7±12.1	−8.5	0.001

INR: International normalized ratio; ASD: Atrial septal defect; VSD: Ventricular septal defect; TOF: Tetralogy of Fallot; AV: Arteriovenous.

Disclosures

Ethics Committee Approval: Our study is not about human participants or animal subjects. The data were obtained by scanning the online database. Therefore, ethics committee approval is not required.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

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