Original Article

Online public interest in smoking and lung cancer: A comparative study in Google Trends

ABSTRACT

Background: Lung cancer is the leading cause of cancer death globally. There is a causal relationship between smoking and lung cancer; nearly 90% of cases are caused by cigarette smoking.

Aim: To investigate the public interest in the relationship between lung cancer and tobacco smoking through an analysis of searches in Google Trends over the past 16 years.

Material and Methods: We conducted a systematic search through Google Trends using the search terms "lung cancer" and "smoking" to identify the numbers of lung cancer and tobacco smoking searches in populations from Turkey, the United States, and the whole world between January 1, 2004 and December 31, 2019.

Results: Online searches that reflect public awareness are nearly identical for both lung cancer and smoking; however, there is an inverse correlation between population interest and incidences of lung cancer and smoking. Furthermore, the numbers of searches on lung cancer and smoking decrease gradually in Turkey, in the world, and in the United States over the years, displaying a slight seasonal pattern.

Conclusion: Informative and educational campaigns covering the whole year are required to raise awareness of the relationship between lung cancer and smoking and keep people argus-eyed.

KEY WORDS: Google trends, lung cancer, search, smoking

Faruk Tas, Kayhan Erturk[1]

Department of Medical Oncology, Institute of Oncology, Istanbul University, Istanbul, [1]Department of Medical Oncology, Koc University, Istanbul, Turkey

For correspondence: Dr. Faruk Tas, Institute of Oncology, Istanbul University, Capa, 34390, Istanbul, Turkey.
E-mail: faruktas2002@yahoo.com

INTRODUCTION

Lung cancer is the second most common malignancy in males (13%) and females (12%) in the United States.[1] In 2020, an estimated 228,820 new cases will be diagnosed and about 135,720 patients will die of lung cancer in the United States.[1] The incidence of lung cancer decreases gradually, yet the lifetime risk of developing lung cancer is still 1 in 15 (6.7%) and 1 in 17 (6%) for men and for women, respectively. Furthermore, lung cancer is the most mortal malignant tumor; it accounts for nearly one-quarter of all cancer deaths (23% and 22% of estimated deaths for males and females, respectively).

The awareness of lung cancer, observed using different methods including websites, has increased over the past years alongside a slight decrease in incidence. The Internet is the main source of health information for the majority of the patients and population. The searches for health-related information make up nearly 5% of all searches on Google, the most popular search engine in the world.[2] Google Trends, a free search website that quantifies interest in topics at the population level by analyzing all search queries for a specific term across various regions and languages, is used as a research tool to analyze the interest of the general population under medical conditions.[3]

Like other tumors, internet search data reflecting the interest of populations can also provide information about lung cancer for estimating its incidence and trends over time.[4-6] The studies were rarely specific to lung cancer alone,[6] or they were mainly associated with other malignancies.[4,5] Some studies found the lung cancer search term

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to be associated with lung cancer incidence,[5] and others showed decreasing search numbers over years;[4] furthermore, seasonal associations were also observed.[5,6] Searches for lung cancer dramatically increased during specific periods of the year, demonstrating the influence of "Lung Cancer Awareness Month" in November.[5,6]

We aimed to question the interest in lung cancer and smoking, which has been implicated in causing lung cancer, through an analysis of searches in Google Trends over the past 16 years.

MATERIAL AND METHODS

We conducted a systematic search through Google Trends using the search term "akciğer kanseri" and "sigara", –which mean lung cancer and cigarette in Turkish, respectively, to identify the numbers of searches on lung cancer and smoking in the Turkish population. In the subset, "Custom data range" was used to determine the number of searches from January 1, 2004 to December 31, 2019. Concurrently, we also conducted a comparative search using the search terms "lung cancer" and "smoking" to identify the numbers of lung cancer and smoking searches in the world and in the United States for the same time period.

The Google Trends application was the main analytical tool used. Data from the application are provided as a "relative search volume index" (RSVI), which shows the number of searches for a given term per time point relative to the total number of searches performed on the Google search engine during that time period. This is scaled from 0 to 100, with 100 denoting the highest search volume for the search term during the time period.[4] Monthly RSVI values were normalized values depending on total searches during a specific period per selected region and assessed over time. The RSVI value of the year was the arithmetic mean of 12 monthly RSVI values in that year. Similarly, the RSVI value of any given month was the arithmetic mean of 16 RSVI values of that month through 16 years.

RESULTS

Lung cancer search numbers were strikingly inversely correlated with lung cancer incidences [Figure 1], and the numbers of lung cancer searches decrease slightly in Turkey and significantly both in the world and in the United States over the years [Figure 1]. Lung cancer searches culminated in spring and autumn and plummeted during winter and especially in summer everywhere [Figure 2].

The search numbers on smoking continuously soared in Turkey, yet they significantly plunged in the world and in the United States over the years [Figure 3]. Interests of the people of the world and the United States were similar, and they showed a cyclical pattern; they increased in spring and decreased in summer (to the lowest) and went up again in autumn [Figure 4]. However, no search variations with respect to seasons were observed in Turkish people.

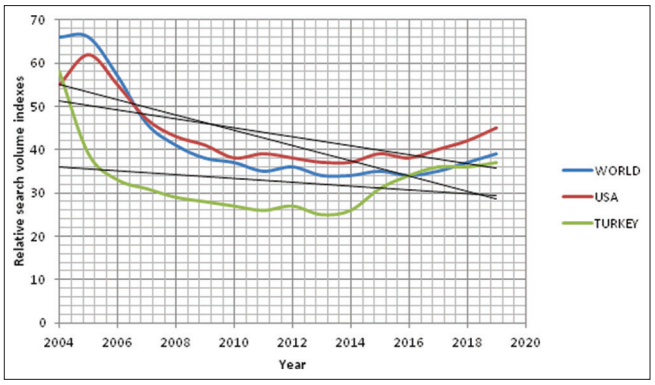


Figure 1: Monthly relative search volume indexes on Google Trends using the term "lung cancer" over the years, between the years 2004 and 2019

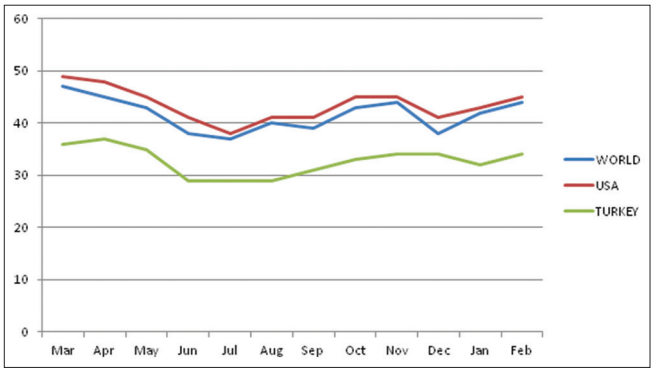


Figure 2: Monthly relative search volume indexes on Google Trends using the term "lung cancer" depending on months, between the years 2004 and 2019

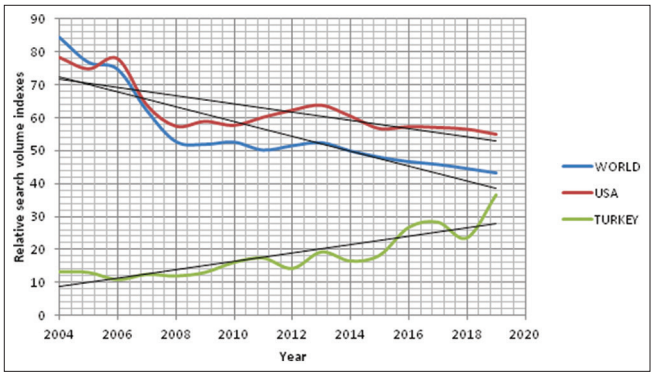


Figure 3: Monthly relative search volume indexes on Google Trends using the term "smoking" over the years, between the years 2004 and 2019

DISCUSSION

Active smoking is the most important risk factor for lung cancer, and former smokers are at increased risk for lung cancer compared with never smokers. In the past 2 decades,

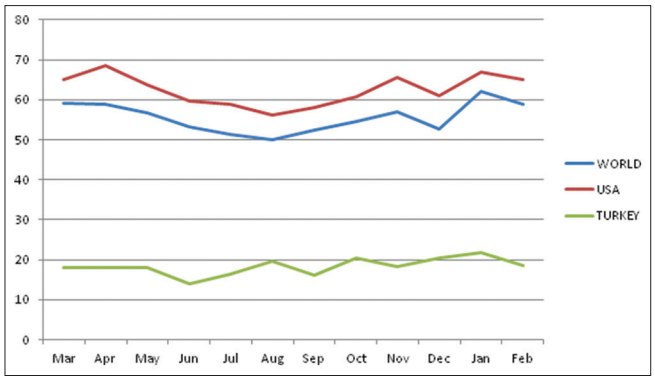


Figure 4: Monthly relative search volume indexes on Google Trends using the term "smoking" depending on months, between the years 2004 and 2019

the incidence of adult smokers has been in decline globally regardless of income level owing to effective anti-smoking campaigns and restrictions.[7,8] Nowadays, one-in-five adults in the world smoke tobacco, and nearly one-third of smokers quit smoking during the past 20 years. From 2000 to 2016, the percentages of smokers have decreased from 27.7%, 31.4%, and 38.4% to 20.5%, 21.8, and 27.2% worldwide, in the United States, and in Turkey, respectively.[7,8] Furthermore, the worldwide average cigarette consumption is 1,083 cigarettes per year per person above the age of 14 (1,017 cigarettes for USA and 1,771 for Turkey).[9] In this study, we observed an inverse correlation between population interest in smoking and incidence of cigarette consumption per capita: more smoking but less searching for Turkey and vice versa for the world and the United States. Likewise, a published study showed that searches for tobacco significantly increased in English-speaking countries, such as the United States, the United Kingdom, Canada, and Australia, in comparison to China, which is ranked 14th in cigarette consumption worldwide with 2,043 cigarette consumptions per year per capita.[6,9]

In connection with the decline of the incidence of smoking over the years, the interest in smoking was minified slightly in the United States and apparently worldwide in contrast to Turkey, where this interest has been on a constant rise. We believe that this increase in interest is the result of intense taxing on cigarettes in recent years, rather than the increased need to question the harms of tobacco smoking.

In our study, the numbers of searches on smoking in the world and the United States were found to be nearly identical, and they showed oscillations and periodicity during the years. They rise in spring and go down in summer and jump up again during autumn. However, the interests of the Turkish people were not significantly different during the years. The seasonal patterns of smoking behavior as cigarette sales are ubiquitous in the literature,[6] which might assist smoking control professionals in organizing the timings of tobacco control measures.[6]

In recent years, the incidence of smoking has been in decline, and the deceleration of the increased rate of lung cancer – and even some equivocal reductions in its prevalence – has been attributed to smoking cessation. Twenty years ago, the prevalence of lung cancer ranked second among all cancers; however, although the rate has not changed in women (12%), there is a limited decrease in men (14 to 13%).[1,10] We found that there was an inverse relationship between people's interest in lung cancer and the incidence of the disease, even though not as strong as the connection with smoking. However, in a study from the United States, the rates of searches for lung cancer were found to be significantly correlated with the incidence of the disease per state.[5]

In our study, we found that throughout the past 16 years, searches for lung cancer have decreased gradually in USA and worldwide and slightly for Turkey with marked oscillations. However, the growing interest in the past few years has been seen in the whole population. Up to now, a number of trials have been conducted using Google Trends to query lung cancer by populations within different time periods that displayed time trends,[4] and seasonality patterns.[5,6] In a study from the United States, it was shown that from the year 2004 to 2017, the majority of the search peaks were reported before 2007, and they gradually decreased over time.[4]

We also observed a seasonality that the lung cancer searches peaked in spring and autumn and they decreased during winter and especially in summer in all places. The controversial findings existed in the literature; some found that search patterns were temporally associated with cancer awareness months (November) and celebrity announcements,[5] whereas others did not conclude such correlations with lung cancer awareness month.[4] Campaigns to raise awareness and funds for research in prevention, early diagnosis, and management of cancer; the effects of media coverage on the diagnosis; and sometimes the death of a famous person because of lung cancer were all temporarily associated with search spikes reflecting public awareness.[4,5]

Furthermore, the seasonality of the search trends on lung cancer had a significantly positive correlation with smoking patterns.[6] This is actually an expected result because of the intense relationship between lung cancer and smoking; searches on lung cancer are generally conducted together with smoking and vice versa.

In conclusion, online search numbers reflecting public awareness are nearly identical in both lung cancer and smoking; furthermore, there is an inverse correlation between population interests and incidence of lung cancer and smoking. The numbers of lung cancer and smoking-related searches decrease steadily everywhere over the years, and moreover, there is a weak seasonality pattern for both searches. Therefore, informative and educational campaigns covering the whole year are required to raise the awareness of lung cancer and smoking and keep people argus-eyed.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2020. CA Cancer J Clin 2020;70:7-30.
2. McDonald L, Simpson A, Graham S, Schultze A, Nordstrom B, Durani P, *et al*. Google searches do not correlate with melanoma incidence in majority English speaking countries. NPJ Digital Med 2018;1:44.
3. Available from: https://trends.google.com/trends/?geo=US. [Last assessed on 2020 May 12].
4. Kaleem T, Malouff TD, Stross WC, Waddle MR, Miller DH, Seymour AL, *et al*. Google search trends in oncology and the impact of celebrity cancer awareness. Cureus 2019;11:e5360. doi: 10.7759/cureus. 5360.
5. Phillips CA, Leahy AB, Li Y, Schapira MM, Bailey LC, Merchant RM. Relationship between state-level google online search volume and cancer incidence in the United States: Retrospective study. J Med Internet Res 2018;20:e6. doi: 10.2196/jmir. 8870.
6. Zhang Z, Zheng X, Zeng DD, Lelschow SJ. Information seeking regarding tobacco and lung cancer: Effects of seasonality. PLoS One 2015;10:e0117938. doi: 10.1371/journal.pone. 0117938.
7. Available from: http://data.worldbank.org/data-catalog/world-development-indicators. [Last assessed on 2020 Jun 02].
8. Ritchie H, Roser M. "Smoking". Published online at OurWorldInData.org. Available from: 'https://ourworldindata.org/smoking'. 2013.
9. Available from: https://en.wikipedia.org/wiki/List_of_countries_by_cigarette_consumption_per_capita. [Last assessed on 2020 Jun 02].
10. Greenlee RT, Murray T, Bolden S, Wingo PA. Cancer Statistics, 2000. CA Cancer J Clin 2000;50:7-33.