Original Article

Worldwide Evaluation of Public Interest in Gynecological Tumors during COVID-19 Pandemic

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──────────────── **Abstract** ────────────────

Aim: During the coronavirus disease-2019 (COVID-19) pandemic, women seeking information about gynecological cancer frequently turn to the internet for help, as they frequently have difficulty accessing gynecological healthcare services. We aimed to determine the global public affinity for gynecologic tumors during the COVID-19 pandemic by using Google Trends (GT).

Methods: This GT analysis study was conducted from July 1st to July 5th, 2020. Authors determined twenty-two keywords related to gynecological cancers and all terms were searched on GT using filters of "Worldwide", "all categories", and "Web search". To evaluate public affinity for gynecologic cancer during the COVID-19 pandemic, three-four-week periods (2020) at the beginning of the COVID-19 pandemic were compared to the same periods (2016-2019) of the past four years.

Results: Comparison of the pandemic era and the past revealed that all terms except "gynecological oncology" were searched less frequently. During the pandemic era, the relative search volume for thirteen of the twenty-two terms decreased significantly. Twelve of twenty-two terms had a lower relative search volume, but three terms, including sarcoma, vulvar cancer, and gynecological cancer, had a significantly higher search volume between May 11th and June 9th, 2020.

Conclusion: There was a significant decrease in public interest in gynecological tumors at the beginning of the COVID-19 pandemic. In the eight weeks after the COVID-19 pandemic announcement, some terms, including gynecological oncology, sarcoma, and vulvar cancer, became significantly more popular than in the pre-pandemic era. During the COVID-19 outbreak, online interest in gynecologic cancers decreased.

Keywords: Coronavirus, COVID-19, Google, Google trends, gynecological tumor, gynecological oncology

Introduction

The new coronavirus disease-2019 (COVID-19), originating from the China, has caused a global health crisis and continues to spread all around the world. According to the latest updates, 45 million COVID-19 cases have been confirmed, and COVID-19 is responsible for about 1.2 million deaths (1). On March 11, the World Health Organization (WHO) recognized a new coronavirus infection as a pandemic. Many governments have implemented social distancing, stay-at-home policies, and quarantine policies. Additionally, outpatient clinic appointments and elective surgical procedures were postponed. Due to difficulties in achieving a professional health system, patients started to use alternative methods to obtain information regarding their disease, including newspapers, television, and the internet (2).

Search engines are the most commonly used way to find any information on the Internet. Google Search (Google Inc., Mountain View, California, USA) is the world's most popular search engine, with nearly all internet users (90%) preferring it for their research (3). Google Trends (GT) is a tool to define search trends properties that show how frequently a given search term is entered into Google's search engine relative to the site's total search volume over a given period. Previously, Lampos et al. (4) used GT to investigate the public interest in influenza-like illnesses. In another study, Teng et al. (5) analyzed the forecasting of the Zika virus epidemic by using GT.

While GT was used to describe public interest in different medical fields such as dermatology, otolaryngology, rheumatology, and urology during the COVID-19 outbreak, none of the studies investigated public interest in gynecological tumors during the COVID-19 pandemic. In this study, we determined the affinity of the public for gynecological tumors during the COVID-19 outbreak.

Methods

Study Design

Since the subject analyzed in the present study does not contain any confidential information, personal or patient data, ethics committee approval was not obtained. This retrospective study was conducted from July 1st to July 5, 2020. Authors determined twenty-two keywords related to gynecological cancers, including endometrial cancer, uterine cancer, cervical cancer, cervical dysplasia, ovarian cancer, sarcoma, vaginal cancer, vulvar cancer, postmenopausal bleeding, human papilloma virus (HPV), brachytherapy, granulosa cell tumor, choriocarcinoma, dysgerminoma, mole hydatiform, womb cancer, gynecological oncology, CA-125, hysterectomy, ovarian cyst, large loop excision of the transformation zone (LLETZ) and smear test. All terms were searched on GT using filters of "Worldwide", "all categories", and "Web search".

Google Trends

GT provides information about any term among similar samples of all searches performed using the Google search engine at a specified time interval. The situation of Internet research could be achieved and downloaded from the website of GT (https://trends.google.com). The score of GT is introduced on a scale ranging from 0 to 100, and a higher score of GT is associated with a higher relative interest in the term (6).

To evaluate public interest in gynecologic cancer during the COVID-19 pandemic, three-four-week periods from the beginning of the COVID-19 pandemic (March 12th- April 10th, April 11th-May 10, and May 11th-June 9th) were compared to the same periods of the past four years (2016-2019). Dates after March 11th, 2020, were evaluated because WHO declared COVID-19 as a pandemic on that date.

Statistical Analysis

Data was analyzed by using SPSS Statistics for Windows, Version 21.0 (IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp). Continuous variables were shown using an arithmetic mean and standard deviations. The normality assumption was checked using the Kolmogorov-Smirnov test. Paired samples, the t-test, and the Wilcoxon test were used to compare differences between groups. P-values less than 0.05 were considered statistically significant.

Results

A comparison of March 12th-April 10th, 2020 and March 12th-April 10th, 2016–2019 revealed that all terms except gynecological oncology were searched less frequently. Additionally, questioning the terms endometrial cancer, uterine cancer, cervical cancer, cervical dysplasia, ovarian cancer, sarcoma, vaginal cancer, HPV, choriocarcinoma, womb cancer, gynecological oncology, CA-125, hysterectomy, ovarian cyst, LLETZ, and smear test statistically significantly decreased. Only the relative search volume of gynecological oncology terms did not decrease during the first period of the pandemic (+10.4, p=0.853) (Table 1).

In the April 11th-May 10th, 2020, period, the relative search volume for 13 of the 22 terms (endometrial cancer, uterine cancer, cervical cancer, cervical dysplasia, ovarian cancer, postmenopausal bleeding, HPV, brachytherapy, granulosa cell tumor, CA-125, hysterectomy, ovarian cyst, and smear test) statistically significantly decreased. Conversely, the relative research volume of nine terms was comparable with pre-pandemic era. None of the terms were searched significantly more frequently than in the previous four years (Table 1).

In the May 11th-June 9th, 2020, period, the relative search volume for 12 of 22 terms (uterine cancer, cervical cancer, cervical dysplasia, ovarian cancer, postmenopausal bleeding, HPV, choriocarcinoma, CA-125, hysterectomy, ovarian cyst, LLETZ, and smear test) had a lower relative search volume. However, the inquiry of seven terms (endometrial cancer, vaginal cancer, brachytherapy, dysgerminoma, granulosa cell tumor, mole hydatidiform, and womb cancer) was similar; however, the search terms (sarcoma, vulvar cancer, and gynecological cancer) had statistically significantly increased compared to the prior 4 years (p=0.045, p=0.015, and p=0.001, respectively). Overall, public interest in 22 terms decreased statistically significantly during the pandemic (-30.2, p=0.001 from March 12th to April 10th, 2020; -30.6, p=0.001 from April 11th to May 10, 2020; and -15.2, p=0.001 from May 11th to June 9th, 2020, respectively) (Table 1).

Discussion

The sources of achieving knowledge have gained variety today, and many people prefer to use the Internet instead of written sources. According to Google data, 4 billion people preferred GT as a search engine, and 25% of that population used GT in the English language (7). During the COVID-19 pandemic, we have the chance to evaluate the public's interest in gynecological tumors by

Table 1. Relative search volume of gynecologic oncology terms

	March 12 - April 10				April 11 - May 10				May 11 - June 9			
	2020	2016-2019	% change	P-value	2020	2016-2019	% change	P-value	2020	2016-2019	% change	P-value
Endometrial cancer	24.3±11.3	35.3±12.7	-31.2	**0.001**	42.5±12.5	51.5 ±15.4	-17.5	**0.003**	54.6±18.4	56.7±19.5	-3.7	0.583
Uterine cancer	30.2±11.3	49.9±15.8	-39.5	**0.001**	35.7±5.2	55.5±15.4	-35.1	**0.001**	42.6±10.7	49.0±12.3	-13.1	**0.014**
Cervical cancer	28.9±7.3	50.5±12.3	-42.8	**0.001**	42.8±6.1	65.9±11.5	-35.1	**0.001**	44.6±5.7	58.5±9.1	-23.8	**0.001**
Cervical dysplasia	23.1±14.7	35.5±21.8	-34.9	**0.007**	22.6±11.6	31.1±12.9	-27.3	**0.005**	26.7±14.8	37.2±15.5	-28.2	**0.001**
Ovarian cancer	32.7±5.1	58.7±12.1	-44.3	**0.001**	32.9±4.7	49.3±8.6	-33.3	**0.001**	50.0±6.1	62.8±8.7	-20.4	**0.001**
Sarcoma	49.8±12.1	62.9±13.8	-20.8	**0.001**	55.2±8.4	58.3±9.3	-5.3	0.128	17.9±3.1	16.2±3.7	10.5	**0.045**
Vaginal cancer	28.2±11.8	39.0±17.4	-27.7	**0.002**	47.3±8.7	49.8±10.9	-5.0	0.349	50.6±16.9	52.2±13.8	-3.1	0.600
Vulvar cancer	31.9±11.4	33.6±15.8	-5.1	0.170	14.7±8.4	16.4±6.7	-10.4	0.252	52.7±11.9	44.7±16.4	17.9	**0.015**
Postmenopausal bleeding	22.7±11.5	27.6±12.2	-17.8	0.619	21.0±8.8	36.1±9.7	-41.8	**0.001**	22.3±8.9	28.8±16.9	-22.6	**0.044**
HPV	33.2±6.6	55.5±12.1	-40.2	**0.001**	48.7±5.3	73.3±13.3	-33.6	**0.001**	28.2± 3.9	37.3±7.4	-22.8	**0.001**
Brachytherapy	30.8±13.6	35.8±16.7	-14.0	0.074	34.4±16.5	45.4±19.8	-24.2	**0.006**	30.9±10.6	30.6±15.5	1.0	0.920
Granulosa cell tumor	17.5±8.8	21.3±9.6	-17.8	0.386	18.2±7.6	19.1±8.2	-4.7	0.761	21.2±8.2	22.1±7.6	-4.1	0.867
Choriocarcinoma	19.2±13.2	34.5±9.9	-44.3	**0.004**	24.5±12.5	29.8±16.7	-17.8	0.107	28.8±13.7	40.2±19.9	-28.4	**0.004**
Dysgerminoma	19.8±12.4	20.1±12.7	-1.5	0.639	6.7±2.4	17.4±11.2	-61.5	**0.001**	24.9±6.8	25.9±6.8	-3.9	0.857
Mole hydatiform	30.1±15.6	35.6±20.1	-15.4	0.967	36.7±6.7	39.8±8.2	-7.8	0.765	42.2±7.8	46.1±5.9	-8.5	0.645
Womb cancer	33.4±21.8	45.7±25.0	-26.9	**0.001**	21.8±7.4	25.3±7.6	-13.8	0.222	28.3±11.8	29.3±13.1	-3.4	0.698
Gynecological oncology	37.1±14.3	33.6±21.2	10.4	0.853	36.2±5.6	32.2±6.5	12.4	0.451	42.6±4.1	33.2±5.8	28.3	**0.001**
Ca-125	30.3±11.2	54.6±16.2	-44.5	**0.001**	32.7±8.6	55.7±12.5	-41.3	**0.001**	42.9±9.3	54.8±11.6	-21.7	**0.001**
Hysterectomy	42.5±8.1	69.2±9.2	-38.6	**0.001**	44.8±4.2	77.7±10.3	-42.3	**0.001**	56.4±7.3	71.0±10.7	-20.6	**0.001**
Ovarian cyst	53.4±10.8	79.1±11.6	-32.5	**0.001**	58.2±6.5	78.1±10.1	-25.5	**0.001**	63.2±6.5	73.7±10.3	-14.2	**0.001**
LLETZ	33.2±18.1	43.2±20.1	-23.1	**0.009**	27.1±8.1	30.9±9.8	-12.3	0.176	23.7±9.3	31.3±12.9	-24.3	**0.010**
Smear test	19.7±6.1	40.5±15.1	-51.4	**0.001**	21.8±5.8	46.2±11.2	-52.8	**0.001**	32.9±8.7	48.7±16.4	-32.4	**0.001**
TOTAL	30.5±12.3	43.7±16.8	-30.2	**0.001**	32.7±17.7	47.1±24.7	-30.6	**0.001**	38.2±17.6	45.1±22.5	-15.2	**0.001**

Data were presented as mean with standard deviation. Statistical analyses were performed using t-test and Wilcoxon tests.
HPV: Human papillomavirus, LLETZ: Large loop excision of the transformation zone, Ca: Cancer antigen

using GT due to restrictions on public transportation, quarantine rules, and difficulties in accessing a professional health system. The study revealed a significant decrease in public interest in gynecological tumors in the first 12 weeks of the COVID-19 pandemic. However, the search for gynecological oncology, sarcoma, and vulvar cancer in GT underwent a significant increase in the 3rd month of the COVID-19 pandemic.

Previous reports compared the public attention to different diseases in different medical disciplines between the pre-COVID-19 period and the COVID-19 period. Kardeş et al. (8) investigated public interest in 32 terms about rheumatic diseases in the United States of America, and the authors claimed that public interest significantly decreased in the first two months of the COVID-19 pandemic. In another study by Guzman and Barbieri (9), physicians stated a significant decrease in public interest in general dermatological conditions, malignant conditions, and cosmetic procedures in the first 15 days of the COVID-19 pandemic. However, interest in general dermatological terms returned to the pre-COVID-19 period one month after the first days of the COVID-19 pandemic. In the aforementioned studies, we found a significant decrease in public attention to gynecological tumors in the first 12 weeks of the pandemic compared to the prior 4 years of the pandemic era.

Every term that is searched on the Google search engine has a different relative search volume. In this study, we found a significantly higher search volume for "gynecological oncology" between 8 and 12 weeks after the beginning of the pandemic compared to the previous four years. We believe that two reasons may have a role in this result; the first is that the term "gynecological oncology" covers all kinds of cancer, and secondly, that term is known by the public better than specific cancer types. We obtained a similar result in terms of "vulvar cancer" and "sarcoma". Due to the aggressive nature of these two tumors and possible delays, the progression of the stage may increase the public interest in these tumors.

Delay in treating any disease due to factors related to COVID-19 and/or COVID-19 may increase disease cost, morbidity, or mortality in patients. Caplan (10) stated that a six-week delay in breast cancer was related to more advanced disease. In another study on endometrial cancer, Dolly et al. (11) found an increase in mortality in patients due to the prolongation of the time from diagnosis to treatment. Jella et al. (12) investigated the effects of the COVID-19 pandemic on hip and knee arthroplasties, and the authors claimed that the COVID-19 pandemic resulted in greater patient volume and economic burden after the crisis. However, there is no literature yet focusing on the impact of the COVID-19 outbreak on the diagnosis and treatment of gynecological tumors, which may be the subject of another study.

Study Limitations

When evaluating the findings of this study, some limitations must be addressed. These findings apply solely to Google search queries. Although Google is the most popular search engine on the planet, more research is needed to determine whether the search behavior described here is similar or different for other search engines or platforms. Our study includes data generated throughout the world; this can be a disadvantage in terms of country-based interpretation. Despite the limitations of the study, it is the strength of the study that it contains a unique and detailed analysis on a curious subject.

Conclusion

Public interest in gynecological tumors significantly decreased at the beginning of the COVID-19 pandemic compared to similar periods in the previous four years. Moreover, this study revealed that eight weeks after the COVID-19 pandemic announcement, some terms including gynecological oncology, sarcoma and vulvar cancer became significantly more popular than the pre-pandemic period compared to the similar periods in the previous four years.

Ethics

Ethics Committee Approval: Since the subject analyzed in the present study does not contain any confidential information, personal or patient data, ethics committee approval was not obtained.

Informed Consent: Since the subject analyzed in the present study does not contain any confidential information, personal or patient data, informed consent was not obtained.

Authorship Contributions

Concept: M.E., F.E., F.Y.G., Design: M.E., F.E., F.Y.G., Data Collection and/or Processing: M.E., F.E., F.Y.G., Analysis and/or Interpretation: M.E., F.E., F.Y.G., Literature Research: M.E., F.E., F.Y.G., Writing: M.E., F.E., F.Y.G.

Conflict of Interest: No conflict of interest was declared by the authors.

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