Original Article

JOMP
Journal of Oral Medicine and Pain

eISSN 2383-8493
J Oral Med Pain 2023;48(4):137-143
https://doi.org/10.14476/jomp.2023.48.4.137

Assessing the Public's Interest in Orofacial Pain Specialists: A Google Trends Analysis

Jack Botros | Mariela Padilla

Orofacial Pain and Oral Medicine Clinic, Herman Ostrow School of Dentistry of USC, Los Angeles, CA, USA

Received October 6, 2023
Revised November 22, 2023
Accepted November 22, 2023

Correspondence to:
Mariela Padilla
Orofacial Pain and Oral Medicine Clinic,
Herman Ostrow School of Dentistry of USC,
925 West 34th St, room 4238, Los Angeles,
CA 90089-0641, USA
E-mail: marielap@usc.edu
https://orcid.org/0000-0003-3078-2544

Purpose: To assess Google Trends (GT) search behavior regarding orofacial pain (OFP) and headaches.

Methods: GT scores for OFP and headache specialists between February 2013 and December 2022 were analyzed. Statistical tests such as Poisson regression analyses, mean differences, and Cohen's D were used to assess the score change over time.

Results: The top three search words for OFP specialists were "temporomandibular joint (TMJ) specialist," "TMJ doctor," and "TMJ dentist," whereas the top three search words for headache specialists were "Headache specialist," "Headache doctor," and "Migraine specialist." Here, TMJ is temporomandibular joint. The GT scores for OFP specialists increased significantly ($p<0.05$) for all years except 2017, with the highest mean difference in 2020. The scores for headache specialists showed similar trends but gradually.

Conclusions: The interest in OFP and headache specialists expressed by Google searches has increased over the years. More awareness is needed regarding the OFP scope of practice, and the use of GT may serve as an indicator.

Keywords: Facial pain; Headache; Trends

INTRODUCTION

On March 31, 2020, the National Commission on Recognition of the Dental Specialties and Certifying Boards in the United States recognized orofacial pain (OFP) as the 12th specialty in dentistry. This indicated that the discipline encompasses the diagnosis, management, and treatment of pain disorders of the jaw, mouth, face, head, and neck. The OFP specialty is dedicated to understanding these disorder's underlying pathophysiology, etiology, prevention, and treatment and improving access to interdisciplinary patient care [1].

An expected impact of this recognition is public awareness of the existence of a body of professionals with the knowledge and skills to treat non-odontogenic pain. OFP discipline expands the profession of dentistry and supports its role in the evolving field of pain management and science. A study [2] described the emergence of specialties in science as a sign of success because the discipline has matured, expanded its knowledge base, and established public legitimacy.

A challenge of any newly recognized discipline is generating awareness regarding its scope of practice for providers, patients, and the public. In 2015, Velji published guidelines for improving awareness regarding global oral health from a provider perspective, which can serve as a reference for new specialties: (1) acceptance of the discipline as a human right, (2) recognition and acknowledgment of the potential contribution, (3) and generation of academic curricula [3]. However, generating awareness among the public

and potential patients expands the health science by demanding more specific care for conditions related to the field.

A newly recognized specialty does not mean that the diseases are new, but rather that the body of knowledge and potential therapies have expanded or are better understood. An example of such evolution is the group of conditions known as temporomandibular disorders (TMD), which are often mislabeled as a patient having "TMJ" [4], which might show in public searches for care. Gross et al. [5] suggested that to foster a change in beliefs and behaviors about clinical conditions, a combination of strategies, such as law and legislation and public education, is needed. To strategize communication with the public and create educational campaigns, a clear understanding of public needs and actual knowledge is required.

Conducting a web search on health-related information is a frequent behavior on the internet. Analyzing the trends on such searches is a valuable strategy for understanding the information-seeking behavior of the population on specific conditions or medical/dental specialties [6]. Google Trends (GT) has proven to be a novel tool for analyzing the level of public interest in a medical field, including diseases and therapeutic options [7,8]. The GT methodology provides analysis occurring in seconds that mine complex metadata sets, measuring the popularity of a search term at a given time, calculated as relative search volume (RSV) [9,10]. Although GT indirectly measures awareness, it can be used to infer interest in a particular topic. The public search for a particular term indicates that they are interested in or curious about the topic related to that term, which could mean that they are already aware of the topic, want to learn more, or are just starting to become aware of it.

Heister et al. [11] used GT to evaluate patient and public awareness of a specific discipline (Interventional Radiology), assessing the relative online interest in the subject compared with two other disciplines in a geographic region across time, identifying peaks of interest in a seasonal pattern, but mainly, a general lack of awareness for the analyzed specialty. In a study to assess the association between public health programs and interest in oral cancer on the internet, the researchers identified an increased popularity of the specific terms over a defined period, confirming the use of GT as an RSV database [12].

Although GT has been previously used to assess pain-related internet searches, no study has evaluated OFP [13,14]. Being the newest dental specialty, it is important to assess the public's awareness and interest in OFP and compare it with a relevant specialty. Therefore, this study aimed to: (i) identify the Google search terms used to search for OFP specialists, (ii) assess the annual change in these keywords' search frequency on GT, and (iii) compare OFP specialists' search findings with those of headache specialists.

MATERIALS AND METHODS

1. Data Acquisition

GT (https://trends.google.com/) was used to obtain users' search data pertaining to their interest in nearby OFP or headache specialists between February 2013 and December 2022. GT normalizes search volumes for a specific keyword, leading to a scale of 0-100. Each point on that scale represents the relative popularity of a particular search term compared with the other searches on Google in the same location and time frame. Trends also exclude terms with low search volumes, repetitive searches from the same user, and queries with special characters [15]. This study follows a modified protocol proposed by Mavraganivi and Ochoa by retrieving data from the "explore" feature using predefined terms, regions, and periods [16]. The search data were downloaded as a Microsoft Excel file and analyzed.

The keywords shown in Table 1 were entered into the search bar separately, and the resulting trend graphs were compared. The choice of search queries was aided using

Table 1. Keywords used in Google Trends search

Orofacial pain	Headache
Orofacial pain specialist near me	Headache specialist near me[a]
Orofacial pain doctor near me	Headache doctor near me[a]
Orofacial pain dentist near me	Headache clinic near me
TMJ specialist near me[a]	Migraine specialist near me[a]
TMJ doctor near me[a]	Migraine doctor near me
TMJ dentist near me[a]	Migraine clinic near me
TMJ clinic near me	
Jaw doctor near me	
Jaw specialist near me	

TMJ, temporomandibular joint.
[a]Used in final search combined using "+".

the "Related Queries" section generated using GT. This section shows similar search keywords entered by users who searched for a particular term. These suggestions were re-entered into the search bar and compared. The top three keywords for each specialty were selected and combined into one search query using the "+" sign. The rationale for choosing three terms for combination is to reduce noise introduction into the data and because GT limits the number of queries that can be combined into one query. The filters "Worldwide," "All Categories," and "Web Search" were used for all searches. The phrase "near me" was included in all search keywords to target the interest in nearby specialists rather than the interest in general information about the specialty.

To avoid bias, the period during which the coronavirus disease (COVID-19) emerged was determined using the surge in Google searches for "COVID" and "COVID-19." This period was analyzed separately.

2. Statistical Analysis

Poisson regression analyses were used to assess the magnitude of change in Google Trends Scores (GTS) for OFP and headache specialists between 2013 and 2022. The quasi-likelihood approach was used to adjust for data overdispersion, where the variance is higher than the mean [3,17]. In this study, the evidence scale was used to adjust for overdispersion. This approach leads to wider confidence intervals and more conservative p-values than traditional Poisson regression. Rate ratios (RR) and 95% confidence intervals (95% CI) were estimated.

The chi-square test was used to test the statistical significance of the estimated RRs (α=0.05). The mean differences (m) in GTS between the years under study and their corresponding Cohen's D (d) were calculated. Cohen's D was used as a standardized measure of difference for comparisons over the years. All statistical analyses were conducted using the SAS software package (version 9.4; SAS Institute).

RESULTS

The top three search words, as per GT, indicating the interest in nearby OFP specialists were "TMJ specialist near me," "TMJ doctor near me," and "TMJ dentist near me," whereas those for headache specialists were "Headache specialist near me," "Headache doctor near me," and "Migraine specialist near me." The time frame related to the spike in SARS-CoV-2 pandemic (COVID-19) searches was between March and May 2020. However, searches on the topic started as early as January 2020. Therefore, the period from January to May 2020 was analyzed separately from the year 2020 and was referred to as "COVID."

The data extracted from GT were visualized in a line graph, as shown in Fig. 1. It was initially observed that the interest in nearby specialists in both fields increased progressively over the years. It was also noticed that after the abrupt decline in searches for both specialties during the

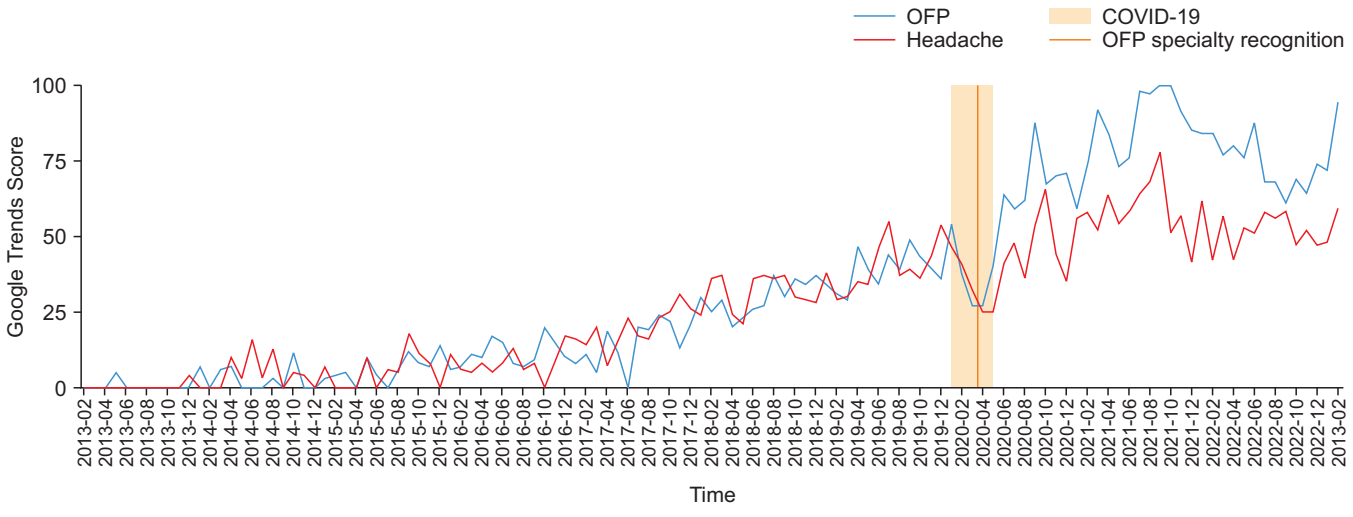

Fig. 1. Google Trends. OFP, orofacial pain; COVID-19, coronavirus disease.

first wave of COVID-19, interest spiked again at higher magnitudes than before the pandemic, particularly for OFP specialists.

Table 2 demonstrates that for eight of the nine years assessed, GTS for OFP specialists increased by 25%-186%. This increase was significant (p<0.05) for all years except 2017 (RR=0.25, 95% CI=−0.11-0.62, p=0.176). Although GTS declined during COVID and 2022, this decline was not significant. Similar findings were demonstrated for headache specialists. Scores increased significantly for seven years but remained almost unchanged in 2015 (RR=0.02, 95% CI=−0.63-0.67, p=0.956). During COVID and 2022, GTS dropped slightly but insignificantly.

Fig. 2 and 3 illustrate the annual distributions of GTS for OFP and headache specialists yearly. This analysis showed that OFP scores increased most substantially in 2020 after the first wave of COVID-19 compared with 2019 (m=30.05, d=3.978). This was followed by GTS growth between 2017 and 2018 (m=17.04, d=2.259). Conversely, the highest GTS growth for headache specialists was in 2017 (m=11.42, d=2.064), followed by 2018 (m=11.83, d=1.891).

DISCUSSION

Studies on other conditions (osteoarthritis and irritable bowel syndrome) have shown that the use of GT to measure

Table 2. Poisson regression analysis assessing the annual change in the average Google Trends Scores of OFP and headache specialists between 2013 and 2022

Year	OFP specialists			Headache specialists		
	RR	95% CI	p-value	RR	95% CI	p-value
2014 vs. 2013	1.86	0.33-3.39	0.017	2.52	0.76-4.27	0.005
2015 vs. 2014	0.74	0.08-1.39	0.029	0.02	−0.63-0.67	0.956
2016 vs. 2015	0.61	0.15-1.08	0.010	0.56	−0.02-1.13	0.057
2017 vs. 2016	0.25	−0.11-0.62	0.176	0.89	0.48-1.30	<0.0001
2018 vs. 2017	0.71	0.41-1.01	<0.0001	0.48	0.19-0.76	0.001
2019 vs. 2018	0.27	0.04-0.50	0.019	0.24	0.00-0.47	0.046
COVID[a] vs. 2019	−0.04	−0.26-0.172	0.689	−0.16	−0.46-0.14	0.216
2020[b] vs. 2019	0.58	0.37-0.78	<0.0001	0.15	−0.09-0.40	0.032
2021 vs. 2020	0.22	0.04-0.40	0.014	0.23	0.01-0.46	0.045
2022 vs. 2021	−0.14	−0.29-0.01	0.058	−0.11	−0.30-0.07	0.228

OFP, orofacial pain; RR, rate ratios; CI, confidence intervals; COVID, coronavirus disease.
[a]January-May 2020.
[b]June-December 2020.

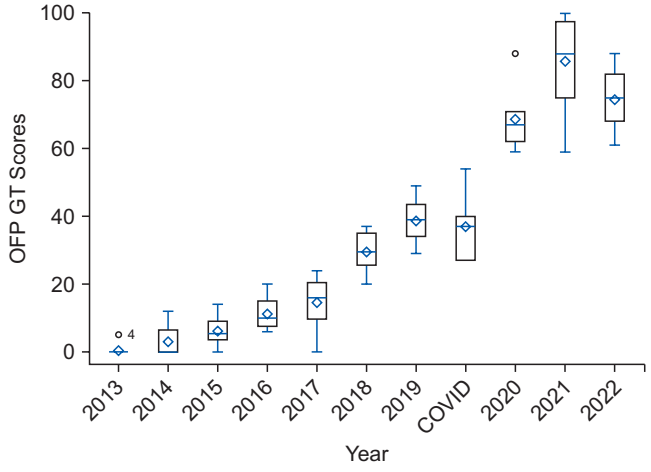

Fig. 2. Box Plot of orofacial pain GT Scores by year. OFP, orofacial pain; GT, Goggle Trends; COVID, coronavirus disease.

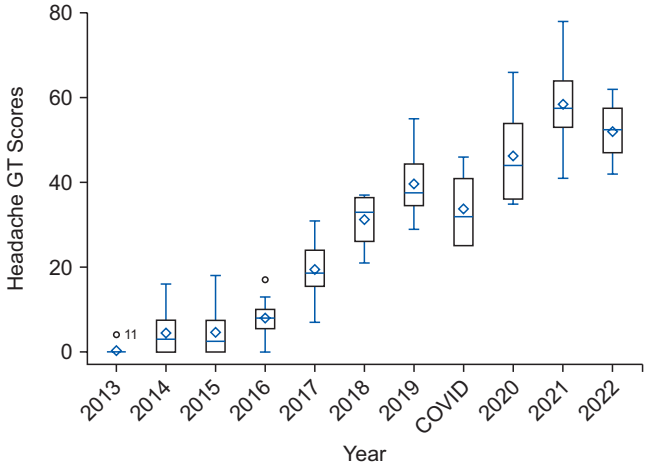

Fig. 3. Box Plot of headache GT Scores by year. GT, Goggle Trends; COVID, coronavirus disease.

public interest is a feasible strategy, and helps to identify increased awareness and strategize decision-making processes [9,18]. GT by itself may be insufficient to measure awareness comprehensively; however, it is a tool that can provide some insights into consumer behavior and trends. Other metrics and research methods, such as surveys, focus groups, and social media analytics, can also be used to obtain a more complete picture of consumer awareness. The presented data provide insight into GT use for understanding the search for care in OFP and elucidate the keywords the public is more familiar with when looking for a provider for TMD and headaches.

Our findings suggest that the public's synonym for an OFP specialist is "TMJ specialist" with the acronym "TMJ" included in the top three searches for OFP providers. This shows the limited awareness of the general population about the discipline and its scope of practice. The American Academy of Orofacial Pain described the specialty's role as "diagnosis, management, and treatment of pain disorders of the jaw, mouth, face, head, and neck" [19]. With this wider perspective, OFP specialists manage a broad spectrum of conditions, including but not limited to TMJ dysfunction. Previous studies have shown a limited understanding of TMD among the general population [20,21]. Although the public's searches for a headache specialist included the term "Migraine specialist," two of the three top search terms included the word "Headache," which is the specialty's most inclusive term.

The recognition of a growing discipline as a new specialty has been described as having a heightened awareness and an interest in the medical profession; however, there is no analysis of the public impact and awareness of the newly recognized field in most of the available publications [22]. Zenilman [23] provided an example of how the need for care may explain why patients and governing bodies expect the recognition of a field when addressing the fact that having specialized surgeons would provide better care to patients requiring breast surgery. Having experts dealing with conditions such as OFP and headaches will simultaneously provide a more targeted diagnosis and treatment and offer practicing clinicians a source for consultations and referrals.

Furthermore, our analysis revealed an abrupt spike in the GT scores for OFP specialists immediately after the first wave of COVID-19. This agrees with previous reports showing an increased prevalence or worsening of TMD symptoms during the pandemic [24,25]. This progression has been related to stress, anxiety, and confinement during the lockdown [26]. The increase in the number of OFP patients or the exacerbation of pre-existing symptoms could explain the sudden increase in specialized care interest. This boost continued in the following year (i.e., 2021) before declining in 2022, when the pandemic started fading. A similar pattern could be seen for headache specialists but more gradually.

To the best of our knowledge, this is the first study to assess search trends associated with OFP. This is also the only study investigating GT searches related to the interest in nearby pain specialists rather than general pain complaints. Our findings are consistent with the literature showing an uptick in the search frequencies related to different pain complaints during the COVID-19 pandemic. Szilagyi et al. [14] reported a significant increase in GT searches associated with back, neck, and abdominal pain after the pandemic onset.

This study should be interpreted in the context of the limitations of using GT data as a proxy for public interest in clinical specialists. First, although Google has 93% of the global market share of search engines, it does not capture the populations with no internet access or where other search engines are more popular [27]. Second, lower levels of education, females, and younger individuals are associated with higher odds of looking for healthcare providers on the internet [28]. This may have caused the overrepresentation of these populations in the analyzed data. Third, demographic data, including sex, age, marital status, and level of education, were unavailable; therefore, subgroup-stratified analyses were impossible. Fourth, the search strategy was only performed in English because of insufficient data in other languages. Additionally, filtering the data by country yielded excessive noise; thus, it was impossible to analyze.

Our results suggest that public interest in OFP and headache specialists has grown progressively over the years, particularly after the COVID-19 pandemic. However, there was a substantial lack of awareness regarding the full scope of OFP, as shown by the search term used. Future research

is encouraged to verify these findings using cross-sectional survey studies that assess the real-life interest and awareness of the public regarding OFP and headache specialists. The OFP governing bodies, providers, and educational institutions should consider generating evidence-based content to ensure that the public finds adequate information when searching for facial or head pain-related clinical care. Additionally, raising awareness regarding the specialty in the medical community is crucial. This is possible through scientific meetings, organized events, and publications.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

DATA AVAILABILITY STATEMENT

The datasets used in this study are available from the corresponding author upon reasonable request.

FUNDING

None.

AUTHOR CONTRIBUTIONS

Conceptualization: MP. Data curation: JB. Formal analysis: JB, MP. Methodology: JB, MP. Project administration: MP. Visualization: JB. Writing - original draft: JB, MP. Writing - review & editing: JB, MP.

REFERENCES

1. Heir GM. Orofacial pain, the 12th specialty: the necessity. J Am Dent Assoc 2020;151:469-471.
2. Casadevall A, Fang FC. Specialized Science. Infect Immun 2014;82:1355–1360.
3. Velji A. Education for global oral health: progress in improving awareness and defining competencies. J Dent Educ 2015;79:351-352.
4. Ohrbach R, Dworkin SF. The evolution of TMD diagnosis: past, present, future. J Dent Res 2016;95:1093-1101.
5. Gross DP, Deshpande S, Werner EL, Reneman MF, Miciak MA, Buchbinder R. Fostering change in back pain beliefs and behaviors: when public education is not enough. Spine J 2012;12:979-988.
6. Lai K, Lee YX, Chen H, Yu R. Research on web search behavior: how online query data inform social psychology. Cyberpsychol Behav Soc Netw 2017;20:596-602.
7. Olivova J, Singh BN, Casciato DJ. Using Google Trends to identify seasonal variation in foot and ankle pathology. J Am Podiatr Med Assoc 2021;111:Article_18.
8. Maugeri A, Barchitta M, Agodi A. Using Google Trends to predict COVID-19 vaccinations and monitor search behaviours about vaccines: a retrospective analysis of Italian data. Vaccines (Basel) 2022;10:119.
9. Flanagan R, Kuo B, Staller K. Utilizing Google Trends to assess worldwide interest in irritable bowel syndrome and commonly associated treatments. Dig Dis Sci 2021;66:814-822.
10. Levinthal DJ. Now trending: using Google Trends to complement traditional epidemiological methods used for IBS research. Dig Dis Sci 2021;66:662-664.
11. Heister D, Jackson S, Doherty-Simor M, Newton I. An evaluation of trends in patient and public awareness of IR. J Vasc Interv Radiol 2018;29:661-668.
12. Lan R, Campana F, Tardivo D, Catherine JH, Vergnes JN, Hadj-Saïd M. Relationship between internet research data of oral neoplasms and public health programs in the European Union. BMC Oral Health 2021;21:648.
13. Kamiński M, Łoniewski I, Marlicz W. "Dr. Google, I am in Pain"-Global Internet searches associated with pain: a retrospective analysis of Google Trends data. Int J Environ Res Public Health 2020;17:954.
14. Szilagyi IS, Ullrich T, Lang-Illievich K, et al. Google Trends for pain search terms in the World's most populated regions before and after the first recorded COVID-19 case: infodemiological study. J Med Internet Res 2021;23:e27214.
15. Google News Initiative. Google Trends: Understanding the Data [Internet]. Google [cited 2023 Mar 4]. Available from: https://newsinitiative.withgoogle.com/resources/trainings/google-trends-understanding-the-data/.
16. Mavragani A, Ochoa G. Google Trends in infodemiology and infoveillance: methodology framework. JMIR Public Health Surveill 2019;5:e13439.
17. Pedan A. Analysis of count data using SAS. Paper presented at: 26th International SAS Conference; 2001 Jan 1; Long Beach, CA, USA. pp. 226-247.
18. Cohen SA, Zhuang T, Xiao M, Michaud JB, Amanatullah DF, Kamal RN. Google Trends analysis shows increasing public interest in platelet-rich plasma injections for hip and knee osteoarthritis. J Arthroplasty 2021;36:3616–3622.
19. American Academy of Orofacial Pain. What Is Orofacial Pain? [Internet]. American Academy of Orofacial Pain [cited 2023 Oct 6]. Available from: https://aaop.org/specialty/.
20. Komo HA, Almutairi MH, Addus AA, et al. Prevalence, knowledge and awareness level of temporomandibular joint disorder among Saudi population. Medical Science 2022;26:e43ms2705.
21. Park HS. The extent of awareness and knowledge regarding temporomandibular disorder among Korean college students. J Oral

Med Pain 2022;47:38-51.
22. Beninger P. Pharmacovigilance: an overview. Clin Ther 2018;40: 1991-2004.
23. Zenilman ME. Evolution of a new specialty. JAMA Surg 2014; 149:193.
24. Saccomanno S, Bernabei M, Scoppa F, Pirino A, Mastrapasqua R, Visco MA. Coronavirus lockdown as a major life stressor: does it affect TMD symptoms? Int J Environ Res Public Health 2020;17:8907.
25. Winocur-Arias O, Winocur E, Shalev-Antsel T, et al. Painful temporomandibular disorders, bruxism and oral parafunctions before and during the COVID-19 pandemic era: a sex comparison among dental patients. J Clin Med 2022;11:589.
26. Karayanni H, Dror AA, Oren D, Sela E, Granot I, Srouji S. Exacerbation of chronic myofascial pain during COVID-19. Advances in Oral and Maxillofacial Surgery 2021;1:100019.
27. StatCounter. Search Engine Market Share Worldwide [Internet]. StatCounter [cited 2023 Jun 27]. Available from: https://gs.statcounter.com/search-engine-market-share.
28. Kontos E, Blake KD, Chou WYS, Prestin A. Predictors of eHealth usage: insights on the digital divide from the Health Information National Trends Survey 2012. J Med Internet Res 2014;16:e172.