

Original Article

# Analysis of interest of Google users (Web, Google Image, and YouTube search) on oral health information among South Indian states

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## ABSTRACT

**Objectives:** The study aimed to analyze the trends of oral health information searches on the web, Google Images, and YouTube in South Indian states.

**Material and Methods:** The retrospective longitudinal study utilized computational metadata from Google Trends, examining the relative search volume of oral health information from 2018 to 2023.

**Results:** The results revealed a significant demand for aligners, dental implants, teeth sets, root canal treatments, and teeth whitening in these states, highlighting the importance of accessible information and education to facilitate informed decisions about oral health care. Regardless of development levels, oral health-related searches increased, influenced by education levels and Internet availability.

**Conclusion:** Oral health-related searches increased in South Indian states regardless of their development levels, with media preference influenced by education levels and Internet availability. This analysis suggests that investing in health education programs can empower individuals to make informed oral health choices, reducing misconceptions regarding dental treatment.

**Keywords:** Aligners, Dental implant, Teeth set, Root canal treatment, Teeth whitening

## INTRODUCTION

The emergence of information and communication technologies has given individuals the ability to access health information and make informed decisions about their well-being. This has led to a growing interest in health-related topics on digital platforms such as search engines, video-sharing sites, and social media.<sup>[1-3]</sup> Various factors, including the individual's information processing skills, influence their preferences when seeking health information online.<sup>[4]</sup> For instance, studies have shown that people tend to prefer videos over written materials in web-based preventive programs due to their effectiveness and engaging nature.<sup>[5]</sup> Similarly, individuals expect to find reliable health content in online videos when searching for answers to their questions.<sup>[6-8]</sup> YouTube (YT), being a popular streaming service with billions of users and daily views worldwide, holds significant potential for delivering health-related information.<sup>[9]</sup> However, it is essential to recognize that the patterns of health-related web (W) searches may differ among individuals residing in different South Indian states, influenced by

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their social, economic, political, cultural, and psychosocial backgrounds. Understanding these patterns can greatly assist in designing effective educational strategies and creating targeted content to combat the spread of misinformation. Therefore, the objective of this study is to analyze the trends in oral health information searches on W search, Google Images (GI) search, and YT specifically within South Indian states.

## MATERIAL AND METHODS

### Methodological approach

The study utilized computational metadata analysis to examine the interests of Internet users in South Indian states concerning oral health in a retrospective manner. The researchers utilized Google Trends to collect monthly data on the relative search volume (RSV) for various oral health topics such as aligners, dental implant, teeth set, root canal treatment, and teeth whitening. The RSV was examined across W search, GI search, and YT platforms from 2018 to 2023 to identify any variations over time.

### South Indian states

Karnataka, Kerala, Telangana, Tamil Nadu, Andhra Pradesh.

### RSV

For data collection in this study, Google Trends was utilized as the platform. Google Trends provides monthly variations in RSVs for specific queries. RSVs are normalized values ranging from 0 to 100, representing the ratio of search volume for a particular keyword compared to overall searches within a given timeframe. The peak value is set as RSV = 100. Google Trends offers filtering options based on location, time, category, and information source. It employs predefined and automatic algorithms to determine RSVs for popular topics by analyzing keywords, sentences, and relevant terms. In this study, the algorithm considered user activity on W search, GI search, and YT from January 2018 to May 2023.<sup>[10]</sup>

### Ethical approval

This study protocol was approved by the institutional review board and ethical approval was obtained (PDCH 5/21-2023).

### Data analysis

Statistical analysis was done using the Statistical Package for the Social Sciences software 20 version. As the data were not normally distributed Kruskal–Wallis test was used to find statistically significant differences between the groups.

## RESULTS

### RSV trends

The analysis of search data revealed notable trends in the usage of aligners, dental implants, teeth sets, root canal treatments, and teeth whitening among South Indian states. RSVs for W, GI, and YT increased in over time [Figures 1 and 2].

### W searches among South Indian states

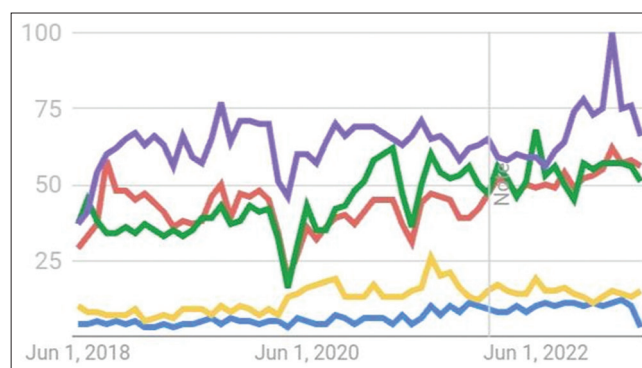
RSV of teeth whitening was higher in Kerala ( $48.15 \pm 17.250$ ). This is statistically significant with  $P < 0.01$ .

### GI searches among South Indian states

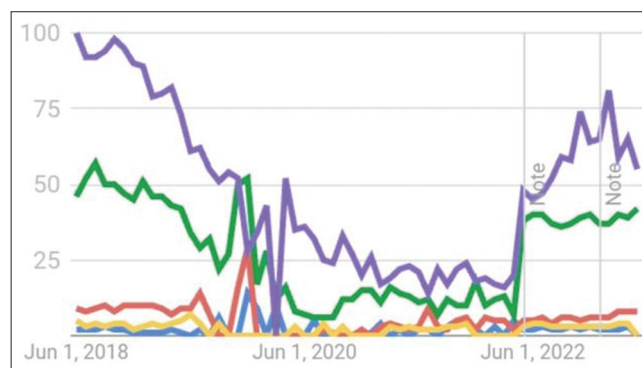
RSV of the dental implant was higher in Andhra Pradesh ( $13.47 \pm 19.902$ ). This is statistically significant with  $P < 0.01$ .

### YT search among South Indian states

RSV of teeth whitening was higher in Telangana ( $14.36 \pm 15.172$ ). This is statistically significant with  $P < 0.01$  [Table 1].



**Figure 1:** Most common web search among the keywords are teeth whitening [violet color], root canal treatment [green color], dental implant [red color], teeth set [yellow color], aligner [blue color].



**Figure 2:** Most common You Tube search among the keywords are teeth whitening [violet color], root canal treatment [green color], dental implant [red color], teeth set [yellow color], aligner [blue color].

**Table 1:** Most common keyword searched among South Indian States in WEB search[W], Google image search [GI], You Tube search [YT]-mean (SD) and P- value.

Keywords and searches	Karnataka mean (SD)	Kerala mean (SD)	Tamil Nadu mean (SD)	Telangana mean (SD)	Andhra Pradesh mean (SD)	P-val/ue
Aligner (W)	8.02±14.215	<b>12.69±19.416</b>	10.47±18.013	11.73±22.857	8.14±18.793	0.001
Dental implant (W)	32.66±19.415	14.70±18.235	<b>33.07±21.498</b>	28.70±24.426	13.47±19.902	0.000
Teeth set (W)	<b>17.63±22.328</b>	7.74±14.935	9.56±13.986	9.28±15.935	6.80±14.226	0.000
Root canal treatment (W)	33.98±19.494	44.72±15.797	<b>49.54±14.774</b>	29.38±19.990	1.58±7.220	0.000
Teeth whitening (W)	42.99±19.022	<b>48.15±17.250</b>	32.72±17.177	40.74±14.306	17.43±19.513	0.000
Aligner (GI)	6.48±15.640	4.79±12.229	5.24±12.870	<b>11.73±22.857</b>	5.11±13.927	0.120
Dental implant (GI)	3.93±10.711	7.26±17.883	9.76±19.888	3.94±11.180	<b>13.47±19.902</b>	0.000
Teeth set (GI)	6.13±16.953	5.33±15.396	4.25±12.426	2.41±8.815	<b>8.05±21.146</b>	0.143
Root canal treatment (GI)	7.89±17.218	5.67±15.199	<b>7.97±16.177</b>	7.20±15.724	5.48±15.856	0.021
Teeth whitening (GI)	7.66±17.278	7.70±16.003	7.57±17.304	<b>8.13±17.988</b>	5.09±13.783	0.708
Aligner (YT)	3.48±10.448	3.23±12.282	1.88±8.139	3.08±10.189	<b>4.19±12.842</b>	0.302
Dental implant (YT)	3.64±11.772	<b>4.36±14.459</b>	2.28±7.967	2.35±8.206	3.34±11.851	0.070
Teeth set (YT)	<b>6.11±16.038</b>	4.80±13.254	2.09±8.896	2.41±8.815	1.58±7.220	0.006
Root canal treatment (YT)	5.13±11.128	6.56±11.145	<b>10.14±13.577</b>	2.31±7.080	5.02±13.804	0.000
Teeth whitening (YT)	8.43±12.221	12.66±13.759	8.34±12.610	<b>14.36±15.172</b>	3.57±9.541	0.000

SD: Standard deviation, W: Web, GI: Google images, YT: YouTube, Bold: Higher usage of the keywords in that area

On examining the search trends in South Indian states, the study identified that root canal treatment was a popular search term specifically in Tamil Nadu. In contrast, teeth whitening was predominantly searched in Telangana and Kerala. The term “teeth set” garnered more attention in Karnataka and Andhra Pradesh. Dental implant, on the other hand, was frequently searched in Kerala, Andhra Pradesh, and Tamil Nadu. Aligners showed a common search interest in Kerala, Andhra Pradesh, and Telangana [Table 1].

Furthermore, when comparing the overall search patterns between the W and YT, teeth whitening had higher search volumes, indicating greater interest from users. In contrast, dental implant was more commonly searched on GIs [Table 2].

## DISCUSSION

The study observed a rise in search volumes related to oral health from 2018 to 2023, with variations among South Indian states. Kerala exhibited higher search volumes on the W, GIs, and YT. Comparing the ratios, it was determined that individuals in South Indian states prefer W searches [Table 2]. This study is the first to compare the interests of W, GIs, and YT users in seeking oral health information, revealing a correlation between search volume and socioeconomic/literacy levels. The significant increase in oral health-related searches in South Indian states can be attributed to the growing Internet penetration, driven by the expansion of digital infrastructure, the popularity of gadgets, and reduced web access costs.<sup>[11-14]</sup> Lower education levels influence user preferences, leading to a preference for consuming videos and images over reading materials. This behavior arises from individuals independently addressing oral symptoms due to barriers in accessing dental

**Table 2:** Most common keyword searched in WEB search[W], Google image search [GI],You Tube search[YT] mean(SD).

Keywords	Searches		
	W mean (SD)	GI mean (SD)	YT mean (SD)
Aligner	10.21±18.928	6.67±16.161	3.17±10.917
Dental implant	24.52±22.509	<b>7.67±16.811</b>	3.19±11.137
Teeth set	10.20±16.991	5.23±15.606	3.40±11.448
Root canal treatment	31.84±23.248	6.84±16.060	5.83±11.864
Teeth whitening	<b>36.41±20.539</b>	7.23±16.549	<b>9.47±13.324</b>

SD: Standard deviation, W: Web, GI: Google images, YT: YouTube, Bold: Higher usage of that keyword compared with other keywords

treatment, such as high costs of private services and limited availability of public dental care.<sup>[15]</sup>

The escalating interest in oral health information on both Google and YT can be linked to the adverse consequences of untreated dental caries in permanent teeth, which greatly impact individuals' quality of life. This behavior often arises from the attempt to self-manage oral symptoms due to barriers hindering access to dental treatment. These barriers include the high costs associated with private dental services and inadequate availability of public dental care options. The choice to use YT as a source of health information can be explained by its rapidly increasing market share, with an annual projected audience growth of approximately 17% until 2021, and its effectiveness in facilitating learning for web users.<sup>[9,16-18]</sup>

Certain methodological aspects require further clarification. Employing this approach can effectively address the negative

outcomes resulting from inadequate self-management of dental issues such as toothaches, malocclusion, and stains. Data were collected from Google Trends as it allows for comparing search volumes of specific topics across the W, GIs, and YT.<sup>[19]</sup> However, these findings should be interpreted with caution. The results are limited to the activity and behavior of users on two specific web platforms and do not consider data from other search engines. The socioeconomic characteristics of individual users cannot be associated with their behaviors as searches are conducted anonymously. In addition, the approach used may lead to an overestimation of user activity due to the inability to exclude duplicate searches by the same person on multiple devices. It is important to note that while increased search activity may indicate a tendency for self-resolution of oral health issues, it does not guarantee the actual utilization of remedies or the adoption of alternative measures.

## CONCLUSION

The study findings indicate that there has been an increase in searches for oral health information on Google and YT, irrespective of a country's level of development. This implies that individuals from various states, regardless of their socioeconomic background, are actively searching for information and solutions related to oral health information. However, the media preferences of users are influenced by factors such as education levels, Internet accessibility, and availability, particularly observed in South Indian states. Further analysis of the data obtained through computation revealed that providing subsidies for health education programs and campaigns can play a key role in empowering individuals to make informed decisions about their oral health. By doing so, this approach can effectively tackle the consequences of insufficient self-management, resulting in better oral health outcomes and decreased burdens on health-care systems. This strategy has the potential to mitigate the harm caused by inadequate self-management of dental issues such as toothaches, malocclusion, and stains, which can lead to unattractive appearance, tooth loss, periodontal problems, and systemic complications.

## Ethical approval

The authors declare that they have taken the Institutional Review Board approval and the approval number is PDCH 5/21-2023.

## Declaration of patient consent

Patient's consent not required as there are no patients in this study.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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