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# GLOBAL GOOGLE TRENDS ANALYSIS OF ORAL CANDIDIASIS: SYNONYMS AND CLASSIFICATIONS (2004–2020)

## *(ANALISIS GOOGLE TRENDS GLOBAL KANDIDIASIS ORAL BERDASARKAN SINONIM DAN KLASIFIKASINYA (2004-2020))*

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**ABSTRACT**

Oral candidiasis can be searched on websites using its synonyms and classifications. Google Trends, a product of Google Inc., is designed to display the level of popularity of search terms. The purpose of this study was to investigate the relationship between oral candidiasis search trends and Google Trends, based on synonyms, classifications, search times, and search locations. This research is an analytical study, utilising secondary data sourced from Google Trends from 2004 to 2020. The population consists of individuals who conducted searches on synonyms and classifications of oral candidiasis from 2004 to 2020 using the Google domain. The sample was obtained through a total sampling approach, and the data were analyzed using the Pearson correlation test. The results showed that the global interest in oral thrush keywords gained the highest popularity value of 100. The results revealed a relationship between oral candidiasis and Google Trends, based on synonyms, classifications, search times, and search location distributions.

**Keywords**: Google trends; infodemiology; oral candidiasis; synonyms

***ABSTRAK***

*Pencarian kandidiasis oral pada website dapat dilakukan dengan menggunakan sinonim dan klasifikasinya. Google Trends merupakan produk dari Google Inc. yang bertujuan untuk menampilkan tingkat popularitas. Tujuan dari penelitian ini adalah untuk melihat hubungan antara tren pencarian kandidiasis oral dengan Google Trends berdasarkan sinonim, klasifikasi, waktu pencarian dan lokasi pencarian. Penelitian ini merupakan jenis penelitian analitik, dengan menggunakan data sekunder yang bersumber dari Google Trends dari tahun 2004-2020. Populasi adalah masyarakat yang melakukan pencarian terhadap sinonim dan klasifikasi kandidiasis oral dari tahun 2004-2020 dengan menggunakan domain Google, sampel diambil secara total sampling. Data dianalisis dengan uji korelasi Pearson. Hasil penelitian menunjukkan bahwa minat global terhadap kata kunci oral thrush memperoleh nilai popularitas tertinggi yaitu 100. Hasil penelitian menyimpulkan adanya hubungan antara Google Trends kandidiasis oral berdasarkan distribusi sinonim, klasifikasi, waktu pencarian, dan lokasi pencarian.*

***Kata Kunci:*** *Google trends; infodemiology; oral candidiasis; sinonim*

## INTRODUCTION

Oral candidiasis, commonly referred to as oral thrush, is one of the most prevalent fungal infections affecting the oral cavity, with significant implications for public health worldwide.[1] This opportunistic infection, primarily caused by Candida albicans and other Candida species, manifests as white or yellow patches on the tongue, inner cheeks, roof of the mouth, and throat.[2] The condition affects millions of individuals globally, with vulnerability observed in immunocompromised patients, infants, elderly populations, and individuals undergoing antibiotic therapy.[3]

The digital age has fundamentally transformed how individuals seek health information, with search engines becoming primary sources for acquiring medical knowledge.[4] Google Trends, as a powerful analytical tool, provides unprecedented insights into population-level health information-seeking behaviours, offering researchers and public health officials valuable data on disease awareness, seasonal patterns, and geographic distribution of health concerns.[5]

Understanding the search behaviour patterns for oral candidiasis is particularly relevant given the condition's diverse clinical presentations and the variety of terminologies used by both healthcare professionals and the public.[6] While medical literature consistently employs the term "oral candidiasis," public searches often utilise colloquial terms such as "oral thrush," "mouth thrush," or "white tongue," reflecting the gap between medical nomenclature and common understanding.[7]

The global burden of oral candidiasis has been increasing, particularly in association with rising rates of immunocompromising conditions, an aging global population, and increased use of broad-spectrum antibiotics.[8] Recent epidemiological studies suggest that oral candidiasis affects approximately 5-7% of newborns, up to 10% of elderly individuals, and significantly higher percentages in immunocompromised populations.[9]

Google Trends analysis offers unique advantages for studying oral candidiasis patterns, including real-time data availability, global coverage, and the ability to capture information-seeking behaviour that may precede formal healthcare encounters.[10,11] This comprehensive analysis aims to provide valuable insights for healthcare professionals, public health officials, and researchers interested in understanding the digital epidemiology of this common yet significant fungal infection. Therefore, the author is interested in conducting research on global search trends related to oral candidiasis using Google Trends from 2004 to 2020. Searches on oral candidiasis using Google Trends are expected to provide up-to-date global information on trends related to oral candidiasis synonyms and classification searches.

## METHOD

This type of research is analytical, utilising secondary data sourced from Google Trends from 2004 to 2020. The population in the study consisted of individuals who searched for synonyms and classifications of oral candidiasis on the Google domain between 2004 and 2020. The sampling technique employs total sampling, where researchers collect all data from synonym tracing and oral classification of candidiasis, without filtering by province, country, or continent. Research variables are the objects of research that become the focus of the research. The dependent variable of the study is the search trend regarding oral candidiasis, and the independent variable is the search trend regarding synonyms and classifications of oral candidiasis.

Pearson correlation analysis aims to determine the level of relationship between variables and the degree of randomness in the relationship between variables. The criteria used to determine Pearson correlation analysis are the significance value, where a value of <0.05 indicates a significant correlation. However, if the significance value is> 0.05, then there is no correlation or no significant relationship between the variables.

## RESULT

The global search for oral candidiasis and its synonyms, using Google Trends data from 2004 to 2020, is presented in Table 1.

**Table 1.** Description of oral candidiasis and synonym tracing trends data

| Keywords | N | Mean | Minimum Value | Maximum Value |
|---|---|---|---|---|
| Oral Candidiasis | 204 | 10,86 | 0 | 24 |
| Oral Candidosis | 204 | 0,16 | 0 | 7 |
| Oral Thrush | 204 | 59,55 | 24 | 100 |
| Oral Mycoses | 204 | 0,00 | 0 | 0 |
| Oral Moniliasis | 204 | 0,24 | 0 | 4 |

The global search trend data obtained through Google Trends for the keyword 'candidiasis' yielded a popularity value of 24. Global interest in oral candidosis keywords gained a popularity value of 7. Global interest in oral thrush keywords gained a popularity value of 100. Global interest in oral keyword mycoses had a popularity value of 0, indicating that it did not appear in searches on Google Trends.

Global interest in the keyword oral moniliasis gained a popularity value of 4. Based on global oral candidiasis search research and classification using Google Trends, the following data was obtained, as shown in Table 2.

**Table 2.** Description of oral candidiasis traceability trends, data, and classification

| Keywords | N | Mean | Minimum Value | Maximum Value |
|---|---|---|---|---|
| Oral Candidiasis | 204 | 28,18 | 0 | 63 |
| Pseudomembranous Candidiasis | 204 | 0,71 | 0 | 13 |
| Atrophic Candidiasis | 204 | 0,61 | 0 | 13 |
| Hyperplastic Candidiasis | 204 | 0,95 | 0 | 16 |
| Angular Cheilitis | 204 | 41,07 | 0 | 82 |
| Median Rhomboid Glossitis | 204 | 1,77 | 0 | 20 |

The global search trend data, as obtained through Google Trends, for the keyword "candidiasis" in the oral category, yielded a popularity value of 63. Global interest in pseudomembranous candidiasis has gained significant popularity, with a value of 13. Global interest in the keyword atrophic candidiasis gained a popularity value of 13. Global interest in the hyperplastic keyword candidiasis gained a popularity value of 16. Global interest in angular cheilitis keywords gained a popularity value of 82. Global interest in the median keyword rhomboid glossitis gained a popularity value of 20. The analysis of Pearson correlation using SPSS version 16 programs yielded the results of oral candidiasis analysis and its synonyms, as shown in Table 3.

**Table 3.** Oral candidiasis and its synonyms: tracing trend analysis

| | Pearson Correlation | Sig. (2-tailed) | N |
|---|---|---|---|
| *Oral Candidiasis* | 1 | | |
| *Oral Candidosis* | 0.03 | 0.669 | |
| *Oral Thrush* | 0.336 | 0.00 | 204 |
| *Oral Mycoses* | . | . | |
| *Oral Moniliasis* | 0.02 | 0.78 | |

Oral candidiasis, with its synonym oral candidosis, has a significance value of >0.05, indicating that oral candidiasis has no relationship with trace trend with oral candidosis, oral moniliasis, and oral mycoses. Oral candidiasis, with its synonym oral thrush, has a significance value of <0.05; thus, it can be concluded that oral candidiasis has a trace trend relationship with oral thrush.

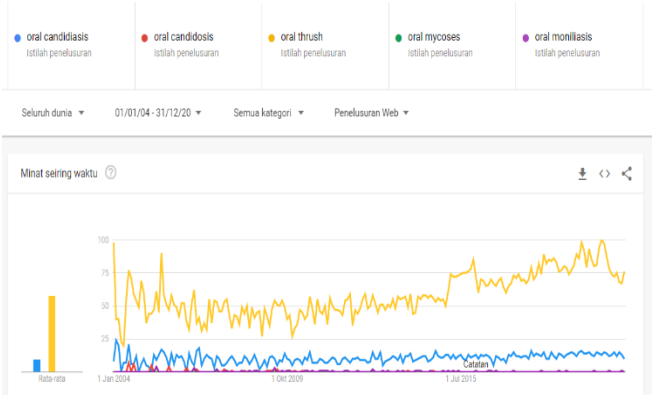


**Figure 1.** Search for Oral Candidiasis and Its Synonyms.


**Figure 2.** Oral Candidiasis Search Trends Across the Globe.

The keyword "oral candidiasis" is represented by blue. If viewed, the trend from 2004 to 2020 on average came in second place with an average value of 10.86. The highest level of the keyword "oral candidiasis" was in April 2004 and July 2006, with a value of 24. The keyword "oral candidosis" is represented in red when viewing the trend from 2004 to 2020, with an average value of 0.16. The keyword "oral thrush" represented in yellow when viewing the trend from 2004-2020 graphically occupies the first position with an average value of 59.55, and this keyword experienced a significant increase in trends every year, with the highest level of search keyword "oral thrush" in July 2019, with a value of 100.

The keyword "oral mycoses" is represented in green when viewing the trend from 2004 to 2020, graphically showing an average value of 0. The keyword "oral moniliasis," represented by the colour purple, from 2004 to 2020, shows an average value of 0.24.

Results obtained are Google users in searching for the keyword "oral candidiasis", the most with the first is the country of Honduras with a value of 100, second-placed Nicaragua with a value of 79, third-placed Mexico with a value of 73, Guatemala with a value of 69, and the last or fifth is El Salvador with a value of 68. Searches for the keyword "oral candidiasis" based on the location of the 5 countries with the highest internet access populations in the world showed that the keyword "oral candidiasis" was not included in the 5 regions with the highest trend against the keyword. The following ranking of countries with the highest internet access population in the world shows Pakistan is 31, India is 32, the United States is 33, and Indonesia is 34.

## DISCUSSION

The Google Trends analysis of oral candidiasis and its synonyms reveals significant disparities in global search behavior, with important implications for healthcare communication and public health awareness. The findings demonstrate a

clear preference for colloquial terminology over medical nomenclature in public information-seeking behavior, consistent with previous studies on health-related search patterns.[5] The most striking finding is the overwhelming dominance of "oral thrush" as the preferred search term, achieving a popularity value of 100 compared to the medical term "oral candidiasis" with a value of 24. This 4:1 ratio suggests that public health communications and patient education materials should prioritize lay terminology to maximize reach and accessibility.[12] The term "oral thrush" has maintained consistent popularity since 2004, with a notable peak in July 2019 (value of 100), potentially correlating with increased awareness campaigns or seasonal outbreak patterns.

The extremely low search volumes for historical terms such as "oral mycoses" (0) and "oral moniliasis" (4) indicate that these terminologies have largely fallen out of public use, reflecting the evolution of medical nomenclature and the need for healthcare providers to adapt their communication strategies accordingly.[13] The term "oral candidosis" (popularity value of 7) shows minimal public adoption despite being medically accurate, suggesting a disconnect between professional and lay vocabulary.

The analysis of specific candidiasis classifications reveals interesting patterns in public awareness and information-seeking behavior. "Angular cheilitis" achieved the highest popularity value (82) among classification terms, likely due to its distinct clinical presentation and the specific nature of patient concerns about lip and mouth corner lesions.[6] This high search volume may also reflect the condition's visibility and the discomfort it causes, prompting immediate information-seeking behavior. The relatively low search volumes for "pseudomembranous candidiasis" (13), "atrophic candidiasis" (13), and "hyperplastic candidiasis" (16) suggest limited public familiarity with medical classifications. These findings indicate that while healthcare professionals use specific diagnostic terminology, patients are more likely to search using symptom-based or anatomically descriptive terms.[14]

"Median rhomboid glossitis" achieved a moderate popularity value of 20, which may reflect its distinctive clinical appearance and the concern it generates among patients who notice the characteristic tongue lesions. This search pattern suggests that visible oral manifestations drive more specific information-seeking behavior compared to generalised infection terms.[15] The Pearson correlation analysis provides crucial insights into the relationships between different search terms. The significant correlation ($p < 0.05$) between "oral candidiasis" and "oral thrush" confirms that these terms are used interchangeably by the public, supporting the hypothesis that lay terminology serves as a gateway to medical information.[16] This relationship suggests that healthcare websites and educational materials should optimise for both terms to capture the full spectrum of information seekers. The lack of a significant correlation ($p > 0.05$) between "oral candidiasis" and its synonyms ("oral candidosis," "oral moniliasis," "oral mycoses")

suggests that these terms represent distinct search behaviours or are used by different populations. This finding has significant implications for the search engine optimisation of healthcare content, suggesting that historical medical terms may not effectively reach contemporary audiences.[17]

The longitudinal analysis from 2004 to 2020 reveals important temporal patterns. The peak search activity for "oral candidiasis" in April 2004 and July 2006 may be correlated with specific healthcare awareness campaigns, research publications, or seasonal factors that affect infection rates.[20] The steady increase in "oral thrush" searches, culminating in the July 2019 peak, suggests growing public awareness and possibly increased incidence or reporting of the condition. The average values over the 16 years ("oral thrush": 59.55, "oral candidiasis": 10.86) demonstrate the sustained preference for colloquial terminology. This trend stability suggests that public communication strategies should consistently prioritise accessible language over medical jargon.[18]

The geographic analysis reveals unexpected patterns that challenge assumptions about the relationship between healthcare infrastructure and health information-seeking behavior. The dominance of Central American countries (Honduras: 100, Nicaragua: 79, Mexico: 73, Guatemala: 69, El Salvador: 68) in "oral candidiasis" searches presents several possible explanations: 1) Countries with limited healthcare infrastructure may drive higher online information-seeking behavior as patients attempt to self-diagnose or understand their conditions before seeking professional care[19]; 2) Higher disease prevalence in tropical climates, combined with socioeconomic factors affecting immune status, may contribute to increased search activity.[20] 3) Populations with emerging internet access may rely more heavily on online health information, particularly for conditions that can be managed with over-the-counter treatments.[21]

The absence of high-internet-penetration countries (Pakistan: 31, India: 32, United States: 33, Indonesia: 34) from the top search rankings suggests that established healthcare systems may reduce the need for online information-seeking, or that these populations prefer different search terms or platforms.[22]

## CONCLUSION

This Google Trends analysis provides valuable insights into global information-seeking behaviour related to oral candidiasis. The clear preference for colloquial terminology over medical nomenclature, the geographic concentration of searches in Central American countries, and the temporal patterns observed provide valuable guidance for healthcare communication strategies, public health interventions, and future research directions. These findings underscore the importance of tailoring medical communication to meet public needs and preferences, ultimately enhancing health literacy and improving patient outcomes.

## CONFLICT OF INTEREST

The authors reported no potential conflict of interest.

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