RESEARCH ARTICLE

REVISED Symptoms trend and challenges in dental practice during delta variance COVID-19 pandemic in Indonesia: Google Trends Analysis [version 2; peer review: 2 approved]

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Abstract

Background: The COVID-19 pandemic has grown to be a serious issue on a global scale. Dental care is one of the industries affected by COVID-19. The surveillance utilizing lifetime data, however, is still not clear. The purpose of this study was to use Google Trends (GT) analysis to examine symptom trends and challenges during the COVID-19 outbreak in Indonesia.
Methods: Covid-19 cases retrieve from Our World in Data. The cases were collected between 1 April 2021-30 September 2021. The GT was used to discover Indonesian relative search volume (RSVs) covering the timeframe of the first outbreak covid-19 pandemic in Indonesia on 1 March 2020 until 13 February 2022. The duration of the search was chosen to reflect the relative popularity of the keywords "symptoms and dentistry practice challenge-related terms" and "coronavirus".
Results: We observed that there was a significant and positive correlation between the COVID-19 daily case using GT RSV data and the COVID-19 case from Our World in Data. The COVID-19 daily case had a strong correlation with search terms related to symptoms (such as fever, sore throat, flu, toothache, and cough), drugs (such as ibuprofen, paracetamol, demacolin, bodrex, and antibiotic), and

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health management (such as self-isolation and telemedicine).
Conclusion: Using GT may be helpful to observe the current symptoms trends as well as its challenge tendencies as a surveillance tool for a continuing pandemic like COVID-19. GT should be considered and used as it has the potential to be a powerful digital epidemiology tool that can provide more insight into disease dynamics.

Keywords
COVID-19, google trends, Dental care, symptoms

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REVISED **Amendments from Version 1**

In this version, we only revised and added the affiliation of the authors. "Faizul Hasan" added a new affiliation of "Faculty of Nursing, Chulalongkorn University, Bangkok, Thailand". "Hendrik Setia Budi" revised the correct affiliation name into "Department of Oral Biology, Dental Pharmacology, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia".

Any further responses from the reviewers can be found at the end of the article

Introduction

The coronavirus disease 2019 (COVID-19) was firstly found in China,[1] was a virus that have been infected many people and caused many deaths worldwide.[2] Unlike a severe acute respiratory syndrome (SARS)[3–5] the COVID-19 incubation period was longer (4–12 days) than that of SARS (2–7 days).[6] In addition, this virus, caused pandemic, has a rapid transmission speed and need special treatment approach.[7] People suffering from COVID-19 can developed several symptoms such as fever, headache, and dry cough.[8,9] Finding the best symptom management are clinically important.

In the early phases of the COVID-19 pandemic, dental healthcare professionals - including dentists, dental assistants, dental hygienists, and nurse practitioners - were aware of the significant risk of exposure.[10,11] It is documented that dentists have a significant risk of transmitting COVID-19 from their patients because of the transmission through respiratory droplets, the use of dental handpieces that produces aerosols, and their near physical closeness with patients.[11–13] Many dental clinics had not identified the spread of SARS-CoV-2 as a significant threat to their patients or themselves. The most recent research demonstrated that SARS-CoV-2 is not only present in saliva but also in the salivary glands, due to the salivary glands and tongue epithelium's angiotensin-converting enzyme 2 (*ACE2*) high expression.[14]

The Centers for Disease Control and Prevention (CDC) advises people to cover their faces when in dental facilities and to take them off only when receiving treatment. It is nonetheless recommended that patients keep their distance from one another in order to reduce the risk of the virus spreading among potentially asymptomatic individuals.[15] By integrating information technology, telemedicine or telehealth provides online medical care to patients who are dispersed out across different locations.[16] Dental professionals can reduce patient interaction before acting by using teledentistry.[17] The dentist who is concerned about patient who have COVID-19, can find employing remote evaluation helpful. Subdivisions of teledentistry with significant roles in dental practice include teleconsultation, tele-diagnosis, teletriage, and tele-monitoring.[18]

Internet search has become the major source of information, including medical and dental terms. In recent years, the internet has established itself as a major resource of information.[19] Through keyword-driven internet searches, people have quick access to a vast amount of information.[19,20] It was estimated that about eighty percent of internet users have looked for health information through online platforms.[21] Big data such as Google Trends (GT) has become the largest potential major source of data for medical and dental studies that need to be properly analyzed and interpreted.[22] The GT service assesses the popularity of internet search queries and can be used as a monitoring tool in a variety of languages and locations around the world.[23] However, no study has investigated the search for symptoms trends and challenges in dental practice particularly during COVID-19 pandemic in Indonesian populations.

Providing life data trend using GT may provide important and updated information for clinical practitioners and health policy makers. The aim of this study was to analyze symptoms trend and challenges in dental practice during the COVID-19 pandemic in Indonesia using the Google trends analysis.

Methods

Confirmed cases of COVID-19 data

COVID-19 cases retrieve from https://github.com/owid/covid-19-data/tree/master/public/data/ maintained by Our World in Data. The cases collected between 1 April 2021-30 September 2021, this time periods were the occurrence of delta variance in Indonesia.

Google trends

Google trends is available at https://trends.google.com.tw/trends/?geo=TW. Google trends was used to discover Indonesian relative search volume (RSVs) covering timeframe of the first outbreak COVID-19 pandemic in Indonesia on 1 March 2020 until 13 February 2022. The search period was used to reflect the relative interest in "coronavirus" and "symptoms and dental practice challenge-related keywords". RSVs ranges from 0-100, with 100 being the highest relative search term activity for specifies search keyword in the time frame period of interest. Google trends only allows a maximum of five terms search, which is enabled to be compared.

Search terms

Bahasa was used to identified search term. Prior to identifying included search terms in each category, we search the potential keyword to understand the Indonesian search interest related symptoms and dental practice challenge. We identified search terms in to three categories: (1) symptoms (e.g., demam, sakit tenggorokan, flu, sakit gigi, batuk); (2) drugs (e.g., ibuprofen, paracetamol, ponstan, demacolin, bodrex, antibiotik), health management (e.g., isolasi mandiri, isoman, telemedicine, teledentistry).

Statistical analysis

To perform all statistical analyses, we used SPSS software version 23.0 (IBM, Armonk, NY, USA). Descriptive analysis using RSVs related keyword was used to identify the trend of symptoms and dental practice challenge during COVID-19 pandemic in Indonesia. A Kolmogorov-Smirnov test was used to test the normality data. The relationship between RSVs and coronavirus (1 April 2021-30 September 2021) was tested using Spearman's rank-order correlation coefficient. The timeframe was chosen to emphasize the highest peak of interest search term during covid-19 pandemic in Indonesia. The correlation was interpreted use following category: r = 0.1-0.2 is very weak, r = 0.3-0.5 is fair, r = 0.6-0.7 is moderate, r = 0.8-0.9 is very strong and r = 1 is perfect.[24]

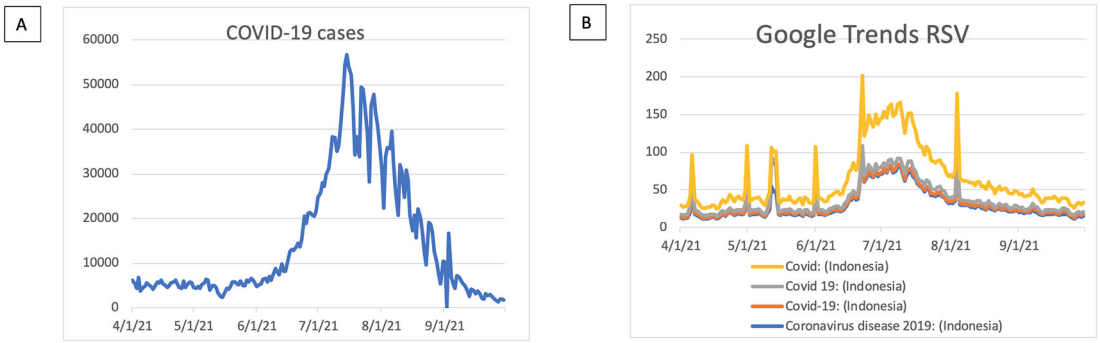

Figure 1. Covid-19 case trends. (A) COVID-19 case based on our Worlds Data. (B) COVID-19 based on Google Trends RSV. RSV = relative search volumes.

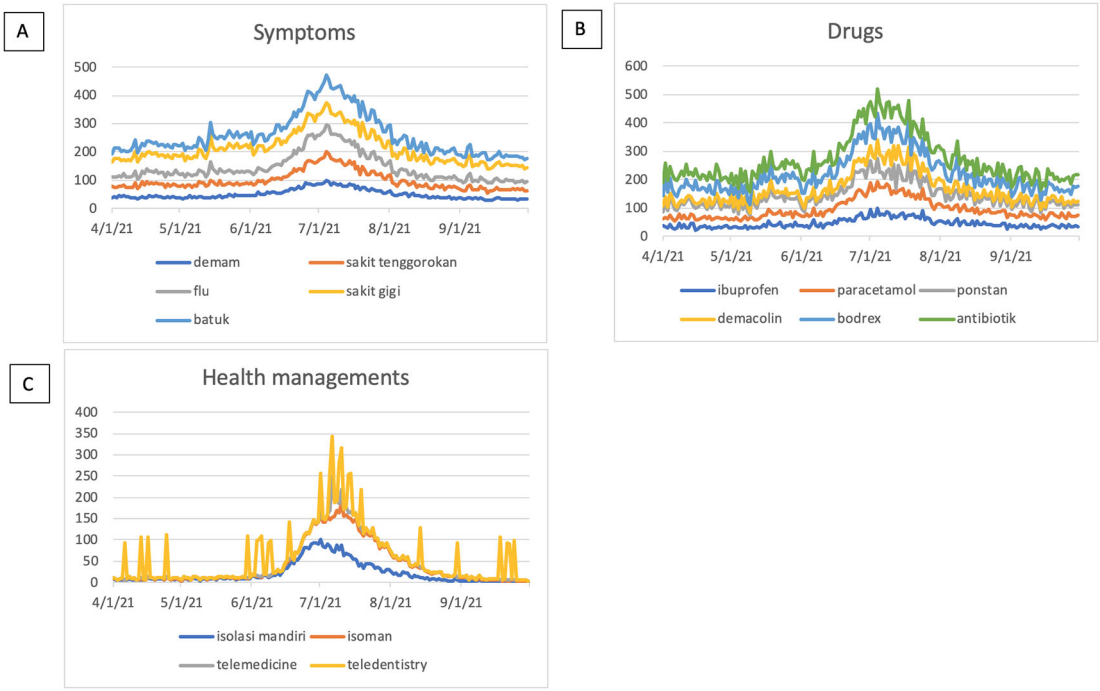

Figure 2. Google trend RSV curves-related search terms. (A) Symptoms-related search terms; fever (In: demam), sore throat (In: sakit tenggorokan), flu (In: flu), toothache (In: sakit gigi), cough (In: batuk). (B) Drugs-related search terms; ibuprofen, paracetamol, ponstan, demacolin, bodrex, antibiotic (In: antibiotik). (C) Health managements-related search terms; self-isolation (In; isolasi mandiri or isoman), telemedicine, teledentistry. RSV = relative search volumes.

Results

COVID-19 cases

The trend of the COVID-19 case based on "Our Worlds Data" was seen in Figure 1A. The pick of COVID-19 cases sharply increased during June 2021 and was seen to have a downtrend after August 2021. In terms of COVID-19 cases using GT RSVs, we used four keywords of "Covid", "Covid 19", "Covid-19", and "Coronavirus disease 2019" used to search the coronavirus-related terms (Figure 1B). We found a similar trend in that the COVID-19 case increased after June 2021 and decreased after August 2021.

Symptoms

The symptoms-related search terms including fever (In: demam), sore throat (In: sakit tenggorokan), flu (In: flu), toothache (In: sakit gigi), and cough (In: batuk) were seen in Figure 2A. The RSVs curves showed increased trends during the COVID-19 uptrend period between June, 2021 and August, 2021. The top five interest by sub region of those symptoms mentioned above were depicted in Figure 3A-E.

Figure 3. Google trend of symptoms RSV curves-related search terms.

Drugs

We examined the search interest related to drugs used during the COVID-19 pandemic. As seen in Figure 2B, there were six drugs that were commonly used during the COVID-19 pandemic (ibuprofen, paracetamol, ponstan, demacolin, bodrex, and antibiotic). Interestingly, those six drugs have shown to have a similar trend that increased during June 2021 and was down after August 2021. Figure 4A-F showed the top five sub-regions related to the drugs-search terms.

Health managements

During the COVID-19 lockdown, RSVs curves revealed a rise in interest in terms associated to health management, including telemedicine, teledentistry, and self-isolation (In: isolasi mandiri or isoman) (Figure 2C). Figure 4A–D listed the highest five searches by sub-region. The heat map in Figure 5D, however, could not be created due to little of data.

Figure 4. Google trend of drugs RSV curves-related search terms.

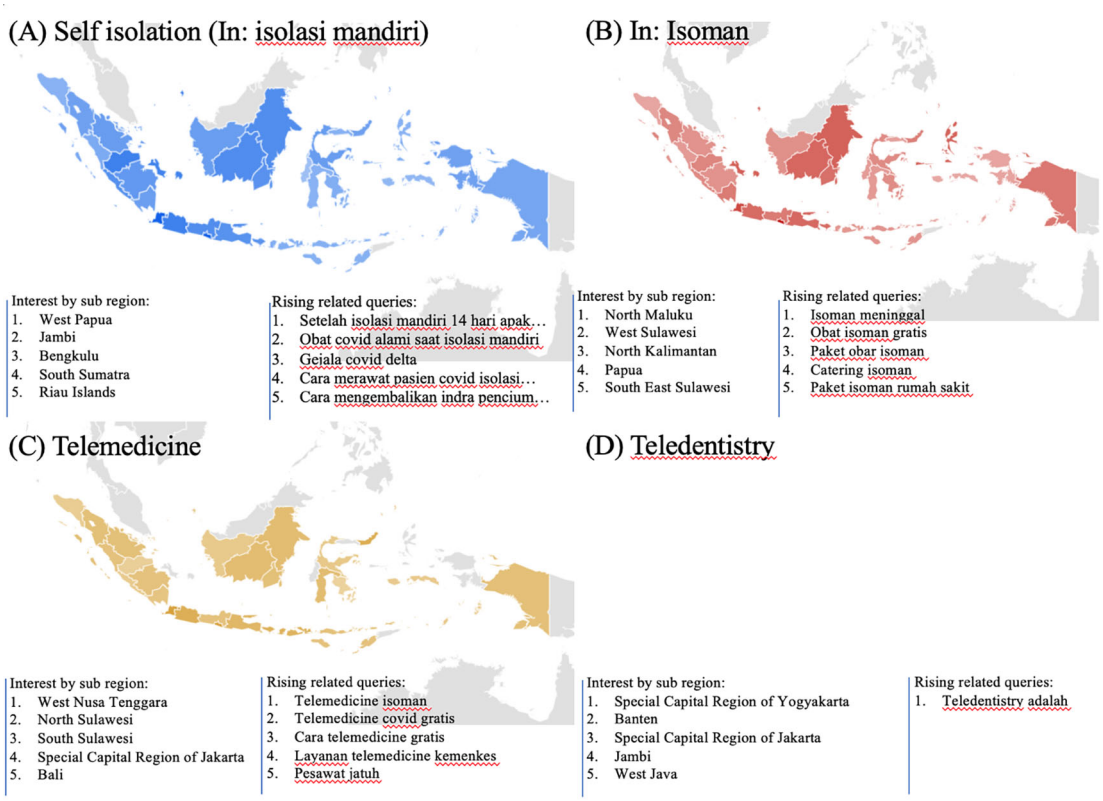

Figure 5. Google trend of health managements RSV curves-related search terms.

Correlations among symptoms, drugs, health management-related RSVs, and COVID-19 Cases

As seen in Table 1, the daily confirmed COVID-19 cases were having a strong and significant positive correlation with COVID-19 using GT ($P < 0.01$). The symptoms-related search terms (fever, sore throat, flu, toothache, and cough) were seen to have positive correlation with COVID-19 case (all $P < 0.01$). Similarly, drugs-related search term also had significant correlation with COVID-19 case (the P-values of ibuprofen, paracetamol, demacolin, and antibiotic were all $P < 0.01$, and ponstan was $P < 0.05$). For health management, the self-isolation, "isoman", telemedicine but not teledentistry were significantly have correlation with COVID-19 case (all $P < 0.01$).

Discussion

To the best of our knowledge, this is the first study investigating the symptoms trend, drugs, and health managements, during COVID-19 pandemic in Indonesia. We observed that there was a significant and positive correlation between the COVID-19 daily case using GT RSVs data and the COVID-19 case from Our World in Data. The COVID-19 daily case had a strong correlation with search terms related to symptoms (such as fever, sore throat, flu, toothache, and cough), drugs (such as ibuprofen, paracetamol, demacolin, bodrex, and antibiotic), and health management (such as self-isolation and telemedicine).

We found that symptoms-related terms such as fever and cough were significantly related to COVID-19 cases. In accordance with evidence that the health experts alerted the public to several primary characteristics of COVID-19, such as fever, persistent coughing, and an absence of taste and smell.[25] In contrast, toothache, the second higher symptom (see, Figure 2A), did not show any statistically significant result. However, with the highly infectious Delta variance, various oral symptoms might be emerging including dysgeusia, ageusia, a burning sensation in the mouth, a dry mouth, hyposmia, and severe halitosis[26,27] that may lead to toothache. Further investigations are warned.

Telemedicine is strongly correlated with COVID-19 based on this present study. The characteristic of the SARS-CoV-2 Delta variant implies that Delta may replicate more quickly and be more aggressive in the early stages of illness.[28] Compared to the Delta variation, the Omicron form is less likely to experience loss of or changes in smell, whereas wheezing of voice and sore throat are much more common. Acute symptom duration was greater for people with the Delta

Table 1. Spearman's correlation of symptoms, drugs, health managements, and COVID-19 data.

Fever	0.758**	0.830**	0.635**	0.879**	0.750**	0.723**	0.330**	0.773**	0.657**	0.918**	0.635**	0.305**	0.115	0.821**	0.657**	0.739**
	Sore throat	0.850**	0.599**	0.852**	0.589**	0.555**	0.308**	0.716**	0.608**	0.773**	0.460**	0.277**	0.085	0.693**	0.564**	0.528**
		Flu	0.685**	0.873**	0.586**	0.565**	0.360**	0.699**	0.604**	0.829**	0.444**	0.254**	0.094	0.696**	0.560**	0.530**
			Toothache	0.680**	0.453**	0.391**	0.381**	0.478**	0.480**	0.592**	0.180*	-0.001	0.086	0.447**	0.279**	0.306**
				Cough	0.756**	0.733**	0.362**	0.798**	0.684**	0.887**	0.623**	0.354**	0.083	0.759**	0.652**	0.694**
					Ibuprofen	0.823**	0.248**	0.735**	0.569**	0.744**	0.755**	0.501**	0.043	0.665**	0.673**	0.736**
						Paracetamol	0.264**	0.718**	0.617**	0.718**	0.849**	0.560**	0.090	0.653**	0.772**	0.774**
							Ponstan	0.279**	0.285**	0.314**	0.154*	0.119	0.083	0.299**	0.252**	0.185*
								Demacolin	0.565**	0.792**	0.659**	0.456**	0.050	0.731**	0.711**	0.711**
									Bodrex	0.626**	0.515**	0.228**	0.082	0.561**	0.481**	0.503**
										Self-isolation	0.655**	0.342**	0.113	0.810**	0.712**	0.751**
											"Isoman"	0.654**	0.008	0.574**	0.806**	0.838**
												Telemedicine	0.172*	0.364**	0.535**	0.547**
													Teledentistry	0.149*	0.062	0.036
														Antibiotic	0.606**	0.650**
															COVID-19 GT	0.745**
																COVID-19 WD

COVID-19 = Corona Virus Disease 2019, GT = Google Trends, WD = Our Worlds Data.
*$P < 0.05$.
**$P < 0.01$.

variant than for people with the Omicron variant.[29,30] Patients should be always encouraged to visit a doctor if they have worrying symptoms that are becoming worse. However, due to social distancing and lockdown, hence many patients were searching for terms related to telemedicine. In order to avoid infection transmission, a modification of inpatient treatment, such as using telemedicine, during the COVID-19 pandemic should be promoted.

Create awareness about the use of teledentistry should be emphasized to become a tool for patient's oral health evaluation and a safe approach to start new treatments during COVID-19 pandemic, and for other diseases with similar pathway of transmission. However, from our findings, teledentistry has an insignificant correlation with COVID-19. These may be due to less knowledge of the patients or dentist to use teledentistry methods, that could lead to a low search level in internet.[31,32] Teledentistry is an effective method for screening the patient's health condition previous to an *in person* dental consultation.[16,17] Using teledentistry for consultations before patients reach dental facilities in a pandemic situation should be incorporated for both, dentists and patients' safety.

We acknowledge several limitations in this study. First, the timeframe was only focused on the specific time of April 2021 until September 2021. The application of the finding in another timeframe during the pandemic may be underestimated. However, that time frame was the important time to see the sever symptom and mortality rate due to COVID-19 in Indonesia. Second, the language-related search terms were used in the national language called Bahasa. As Indonesia has hundred local languages, those terms may be not adopted in this current study. However, since Bahasa become the only national language and is mostly considered the first language to share information on the internet, this current study was still rigorous. Lastly, GT did not measure symptoms directly but used the search term trends. The real symptom's characteristics should be validated further.

Conclusion

Using GT may be helpful to observe the current symptoms trends as well as its challenge tendencies as a surveillance tool for a continuing pandemic like COVID-19, particularly in the countries consisted of many islands and supported with proper internet accessed. GT should be considered and used as it has the potential to be a powerful digital epidemiology tool that can provide more insight into disease dynamics. Future improvements can be made, such as merging other digital data types such as Twitter and Facebook, in an attempt to increase the model's capacity for prediction.

Data availability

Underlying data

COVID-19 case data available from: https://github.com/owid/covid-19-data/tree/master/public/data/

Google Trend data available from: at https://trends.google.com.tw/trends/?geo=TW. Search terms and other parameters are provided in the text.

References

1. China Novel Coronavirus I RT: **A Novel Coronavirus from Patients with Pneumonia in China.** *N. Engl. J. Med.* 2019; **2020**.
2. Organization WH: **Novel Coronavirus (2019-nCoV): situation report, 3.** 2020.
3. Huang Y: **The SARS epidemic and its aftermath in China: a political perspective. Learning from SARS: Preparing for the next disease outbreak.** 2004; pp. 116–136.
4. Xu R-H, He J-F, Evans MR, *et al.*: **Epidemiologic clues to SARS origin in China.** *Emerg. Infect. Dis.* 2004; **10**(6): 1030–1037.
PubMed Abstract | Publisher Full Text | Free Full Text
5. Zhong N, Zheng B, Li Y, *et al.*: **Epidemiology and cause of severe acute respiratory syndrome (SARS) in Guangdong, People's Republic of China, in February, 2003.** *Lancet.* 2003; **362**(9393): 1353–1358.
PubMed Abstract | Publisher Full Text | Free Full Text
6. Lai C-C, Liu YH, Wang C-Y, *et al.*: **Asymptomatic carrier state, acute respiratory disease, and pneumonia due to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2): Facts and myths.** *J. Microbiol. Immunol. Infect.* 2020; **53**(3): 404–412.
PubMed Abstract | Publisher Full Text | Free Full Text
7. Petersen E, Koopmans M, Go U, *et al.*: **Comparing SARS-CoV-2 with SARS-CoV and influenza pandemics.** *Lancet Infect. Dis.* 2020; **20**: e238–e244.
PubMed Abstract | Publisher Full Text | Free Full Text
8. Wang H-Y, Li X-L, Yan Z-R, *et al.*: **Potential neurological symptoms of COVID-19.** *Ther. Adv. Neurol. Disord.* 2020; **13**: 1756286420917830.
9. Sampaio Rocha-Filho PA: **Headache associated with COVID-19: Epidemiology, characteristics, pathophysiology, and management.** *Headache.* 2022; **62**: 650–656.
PubMed Abstract | Publisher Full Text | Free Full Text
10. Manuballa S, Abdelmaseh M, Tasgaonkar N, *et al.*: **Managing the oral health of cancer patients during the COVID-19 pandemic: Perspective of a dental clinic in a cancer center.** *J. Clin. Med.* 2020; **9**(10): 3138.
PubMed Abstract | Publisher Full Text | Free Full Text
11. Pereira LJ, Pereira CV, Murata RM, *et al.*: **Pereira-Dourado SM. Biological and social aspects of Coronavirus Disease 2019 (COVID-19) related to oral health.** *Braz. Oral Res.* 2020; **34**: e041.
PubMed Abstract | Publisher Full Text

12. Shahin SY, Bugshan AS, Almulhim KS, *et al.*: **Knowledge of dentists, dental auxiliaries, and students regarding the COVID-19 pandemic in Saudi Arabia: a cross-sectional survey.** *BMC Oral Health.* 2020; **20**(1): 1–8.
Publisher Full Text

13. Araujo MW, Estrich CG, Mikkelsen M, *et al.*: **COVID-19 among dentists in the United States: A 6-month longitudinal report of accumulative prevalence and incidence.** *J. Am. Dent. Assoc.* 2021; **152**(6): 425–433.
PubMed Abstract | Publisher Full Text | Free Full Text

14. Xu J, Li Y, Gan F, *et al.*: **Salivary glands: potential reservoirs for COVID-19 asymptomatic infection.** *J. Dent. Res.* 2020; **99**(8): 989.
PubMed Abstract | Publisher Full Text

15. Control CfD, Prevention: **Guidance for dental settings.** 2021.

16. Battineni G, Nittari G, Sirignano A, *et al.*: **Are telemedicine systems effective healthcare solutions during the COVID-19 pandemic?** *J. Taibah Univ. Med. Sci.* 2021; **16**(3): 305–306.
Publisher Full Text

17. Caffery LJ, Farjian M, Smith AC: **Telehealth interventions for reducing waiting lists and waiting times for specialist outpatient services: A scoping review.** *J. Telemed. Telecare.* 2016; **22**(8): 504–512.
Publisher Full Text

18. Ghai S: **Teledentistry during COVID-19 pandemic.** *Diabetes Metab. Syndr. Clin. Res. Rev.* 2020; **14**(5): 933–935.
PubMed Abstract | Publisher Full Text | Free Full Text

19. Cervellin G, Comelli I, Lippi G: **Is Google Trends a reliable tool for digital epidemiology? Insights from different clinical settings.** *J. Epidemiol. Glob. Health.* 2017; **7**(3): 185–189.
PubMed Abstract | Publisher Full Text | Free Full Text

20. Brownstein JS, Freifeld CC, Madoff LC: **Digital disease detection—harnessing the Web for public health surveillance.** *N. Engl. J. Med.* 2009; **360**(21): 2153–2157.
PubMed Abstract | Publisher Full Text | Free Full Text

21. Kontos E, Blake KD, Chou W-YS, *et al.*: **Predictors of eHealth usage: insights on the digital divide from the Health Information National Trends Survey 2012.** *J. Med. Internet Res.* 2014; **16**(7): e3117.
Publisher Full Text

22. Nuti SV, Wayda B, Ranasinghe I, *et al.*: **The use of google trends in health care research: a systematic review.** *PLoS One.* 2014; **9**(10): e109583.
PubMed Abstract | Publisher Full Text | Free Full Text

23. Arora VS, McKee M, Stuckler D: **Google Trends: Opportunities and limitations in health and health policy research.** *Health Policy.* 2019; **123**(3): 338–341.
PubMed Abstract | Publisher Full Text

24. Akoglu H: **User's guide to correlation coefficients.** *Turk. J. Emerg. Med.* 2018; **18**(3): 91–93.
Publisher Full Text

25. Rodríguez MD, Romera AJ, Villarroel M: **Oral manifestations associated with COVID-19.** *Oral Dis.* 2020.

26. Brandão T, Gueiros L, Melo T, *et al.*: **Oral lesions in SARS-COV-2 infected patients: could the oral cavity be a target organ.** *Oral Surg. Oral Med. Oral Pathol. Oral Radiol.* 2020; **131**: e45–e51.
Publisher Full Text

27. Glavina A, Biočina-Lukenda D, Mravak-Stipetić M, *et al.*: **Oral symptoms and lesions in SARS-CoV-2 positive patient.** *Oral Dis.* 2020; **28**: 979–980.
Publisher Full Text

28. Hart WS, Miller E, Andrews NJ, *et al.*: **Generation time of the alpha and delta SARS-CoV-2 variants: an epidemiological analysis.** *Lancet Infect. Dis.* 2022; **22**(5): 603–610.
PubMed Abstract | Publisher Full Text | Free Full Text

29. Wise J: **Covid-19: Symptomatic infection with omicron variant is milder and shorter than with delta, study reports.** *BMJ: British Medical Journal.* 2022; 377.
Publisher Full Text

30. Menni C, Valdes AM, Polidori L, *et al.*: **Symptom prevalence, duration, and risk of hospital admission in individuals infected with SARS-CoV-2 during periods of omicron and delta variant dominance: a prospective observational study from the ZOE COVID Study.** *Lancet.* 2022; **399**(10335): 1618–1624.
PubMed Abstract | Publisher Full Text | Free Full Text

31. Raucci-Neto W, de Souza PM, Cerqueira NM, *et al.*: **Knowledge, Perception, and Experience of Dentists About Teledentistry.** *Int. Dent. J.* 2021; **72**: 456–462.
PubMed Abstract | Publisher Full Text | Free Full Text

32. Aboalshamat KT: **Awareness of, beliefs about, practices of, and barriers to teledentistry among dental students and the implications for Saudi Arabia Vision 2030 and coronavirus pandemic.** *J. Int. Soc. Prev. Community Dent.* 2020; **10**(4): 431–437.
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✔ **Sri Susanty**
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No further comments to make. Thank you for your hard work.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Gerontologies, healthy ageing, community health

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 18 September 2023

https://doi.org/10.5256/f1000research.154800.r186201

✔ **Merlya Balbeid**
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Very interesting research, Google trends was used to discover Indonesian relative search volume (RSVs) covering the timeframe of the first outbreak of the COVID-19 pandemic in Indonesia. Bahasa was used to identify search items, but has limitations because Indonesia has a hundred local languages. It has potential to be a powerful digital epidemiology tool which can provide more insight into disease dynamics.

References
1. Balbeid M, Rachmawati Y, Wibowo M: The correlation between the knowledge level related to practice protocols and dentists' anxiety levels in practice during the COVID-19 pandemic. *Dental Journal (Majalah Kedokteran Gigi)*. 2022; **55** (2): 99-104 Publisher Full Text

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Public health

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 19 July 2023

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Sri Susanty
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The purpose of this manuscript is to help improve oral health status. However, I would like to

point out some issues, as below:

1. What are the restrictions on dental care practice (dental issues) in relation to the “bahasa” search terms used by the authors? Please be descriptive (are they in the mouth, throat, teeth, or gums).

2. Please have a look at the list of medications that dentists frequently use based on the issue. You can utilize diclofenac, paracetamol, ibuprofen, and mefenamic acid if the issue is pain. This is significant because these medications cannot be used for other dental conditions.

3. In terms of the drug terminology used in your search terms, the drugs you list are still very general (there are symptomatic drugs to reduce pain symptoms, and there are causative bacteria). I suggest the authors group them.

4. What was the reason the authors used "demacolin and bodrex," which contain antihistamines while having a dental issue?

5. Why would the authors choose to use painkillers (ibuprofen, paracetamol, ponstan) or antibiotics for tooth infections? I suggest the authors write it clearly.

6. Why do the authors only take terminology from the patent name (brand) of a drug? And why were these brands chosen? Did the authors consider the price of branded drugs which are expensive and not necessarily used in dental health facilities?

7. Treatment of dental problems does not only use pharmacological therapy. However, Indonesia also uses traditional medicine and non-pharmacological therapy. Why don't the authors consider this?

8. Management of dental problems such as plaque does not always use oral medication, but also gargling with an antiseptic. Why did the authors not include mouthwash terminology? Why are the authors only considering oral medication? What about using albothyl and betadine? I know this is viral in Indonesia.

9. What about other dental problems such as canker sore? Generally, people use vitamin C before going to the doctor. Why did the authors not consider including the keyword vitamin C?

10. I failed to understand the use of antibiotics in the search item. What antibiotics did the authors use? Amoxicillin? Cotrimoxazole? Or penicillin? I suggest the authors consider this to avoid bias.

Is the work clearly and accurately presented and does it cite the current literature?
Partly

Is the study design appropriate and is the work technically sound?
Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Partly

Are all the source data underlying the results available to ensure full reproducibility?
Partly

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Gerontologies, healthy ageing, community health

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 02 Aug 2023

Faizul Hasan

Reviewer 1 (Dr. Sri Susanty):
The purpose of this manuscript is to help improve oral health status. However, I would like to point out some issues, as below:
Response: Thank you for your thorough review. We carefully considered your suggestions and comments and revised our manuscript accordingly. The following are our specific responses to each of the comments. We hope the revisions are satisfactory and that our responses adequately address the comments.

What are the restrictions on dental care practice (dental issues) in relation to the “bahasa” search terms used by the authors? Please be descriptive (are they in the mouth, throat, teeth, or gums).
Response: The study primarily focuses on highlighting the symptoms, trends, and challenges in dental practice during the COVID-19 pandemic in Indonesia. The search term "sakit gigi" (translated to "toothache" in English) was used to emphasize major dental problems and related issues. However, regarding specific restrictions on dental care practice in relation to the "bahasa" search terms, the study does not provide explicit information on that matter. Instead, it aims to shed light on the impact of the pandemic on dental health and practices in Indonesia.

Please have a look at the list of medications that dentists frequently use based on the issue. You can utilize diclofenac, paracetamol, ibuprofen, and mefenamic acid if the issue is pain. This is significant because these medications cannot be used for other dental conditions.
Response: We agree with you. Hence, in this study, we only focus on the frequent drug used to counter dental pain such as “ibuprofen” and “paracetamol”.

In terms of the drug terminology used in your search terms, the drugs you list are still very general (there are symptomatic drugs to reduce pain symptoms, and there are causative bacteria). I suggest the authors group them.
Response: Thank you for your suggestion. In the first stage, we list several drugs and see the trend. However, some of the terms did not provide a good trend. Therefore, in the final results, we only include the term that showed a significant trend in association with COVID-19.

What was the reason the authors used "demacolin and bodrex," which contain antihistamines while having a dental issue?
Response: We found that “demacolin” and “bodrex” have increased trends during the delta variance periods (see Figure 2B). As we know these two medications are generally and regularly used by Indonesian people if they feel unwell as the first self-medication before going to healthcare providers. Because the symptoms of COVID-19 include fever and flu, so the search terms for administration of these medications were high. In addition, some users considered taking medication (paracetamol, an ingredient of bodrex) before or after vaccination (see Figure 4B).

Why would the authors choose to use painkillers (ibuprofen, paracetamol, ponstan) or antibiotics for tooth infections? I suggest the authors write it clearly.
Response: As mentioned in the response to question number 3, painkillers (ibuprofen, paracetamol, ponstan) or antibiotics provide increasing trends during the delta variance periods (Figure 2B). However, we are not sure whether this medication is used for tooth infection because it is out of our study aim.

Why do the authors only take terminology from the patent name (brand) of a drug? And why were these brands chosen? Did the authors consider the price of branded drugs which are expensive and not necessarily used in dental health facilities?
Response: As we explained in the previous response, firstly we include all related terms including generic and patent names of the drug, however, some of them did not provide good trends. As a note, Google trends provided data based on the users' search on Google machine but not the real symptom, so the final term included in this study actually the real-time search engine data. We already acknowledge this in the limitation section.

Treatment of dental problems does not only use pharmacological therapy. However, Indonesia also uses traditional medicine and non-pharmacological therapy. Why don't the authors consider this?
Response: We also used the term for traditional medicine such as “jamu” or non-pharmacological therapy such as “pijat”. However, we did not find trends during the intended periods.

Management of dental problems such as plaque does not always use oral medication, but also gargling with an antiseptic. Why did the authors not include mouthwash terminology? Why are the authors only considering oral medication? What about using albothyl and betadine? I know this is viral in Indonesia.
Response: We mainly focus on dental pain as it is considered the main problem. The other problem such as cleaning plaque was not our study aim. In addition, the term albothyl or

betadine also did not provide a good trend during the study periods.

What about other dental problems such as canker sore? Generally, people use vitamin C before going to the doctor. Why did the authors not consider including the keyword vitamin C?
Response: We did use the term “Vitamin C”, however, it did not show a significant trend.

I failed to understand the use of antibiotics in the search item. What antibiotics did the authors use? Amoxicillin? Cotrimoxazole? Or penicillin? I suggest the authors consider this to avoid bias.
Response: The detail of the antibiotic was provided in Figure 4F. It included amoxicillin, oseltamivir, “obat antibiotic covid”.

Competing Interests: None