



QUALITY IMPROVEMENT IN DENTAL AND MEDICAL KNOWLEDGE, RESEARCH, SKILLS AND ETHICS FACING GLOBAL CHALLENGES

Edited by

Armelia Sari Widyarman, Muhammad Ihsan Rizal,
Moehammad Orliando Roeslan & Carolina Damayanti Marpaung



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Armelia Sari Widyarman, Muhammad Ihsan Rizal,
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Damayanti Marpaung
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Preface

Faculty of Dentistry Universitas Trisakti (Usakti) presents FORIL XIII 2022 Scientific Forum Usakti conjunction with International Conference on Technology of Dental and Medical Sciences (ICTDMS) on December 8th–10th 2022. The theme of the conference is “Quality Improvement in Dental and Medical Knowledge, Research, Skills and Ethics Facing Global Challenges”.

The triennial conference has served as a meeting place for technical and clinical studies on health, ethical, and social issues in field medical and dentistry. It is organized around 12 major themes, including behavioral, epidemiologic, and health services, conservative dentistry, dental materials, dento-maxillofacial radiology, medical sciences and technology, oral and maxillofacial surgery, oral biology, oral medicine and pathology, orthodontics, pediatrics dentistry, periodontology, and prosthodontics.

The most recent findings in fundamental and clinical sciences related to medical and dental research will be presented in the conference that will be published as part of the conference proceeding. This proceeding will be useful for keeping dental and medical professionals up to date on the latest scientific developments.

Dr. Aryadi Subrata
Chairman FORIL XIII conjunction with ICTDMS

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Saliva as a diagnostic tool for COVID-19: Bibliometric analysis

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ABSTRACT: **Background:** The COVID-19 outbreaks have recently become the focus of a significant amount of interest from medical professionals and researchers all around the world. A prompt and accurate diagnosis is one of the most important steps in managing the outbreak. Because of its advantages in non-invasive sampling, saliva is still being studied as a promising diagnostic tool for oral and systemic diseases particularly COVID-19. **Objective:** The purpose of this paper is to evaluate and describe the scientific literature on the diagnosis of COVID-19 utilizing saliva as a diagnostic tool using bibliometric indicators. **Method:** All types of publications on Scopus regarding saliva as a COVID-19 diagnostic tool were extracted, but only those published between 2019 and 2022 with specific keywords were included. The data were analyzed and visualized using a variety of tools and software, including VOSviewer, OpenRefine, and Tableau Desktop. **Main findings:** There are 814 publications accessible, including 603 journal articles, 111 review articles, 12 conference papers, 3 book chapters, and 85 other types of documents such as letters, notes, and editorials. Participating in the writing of publications on saliva as a COVID-19 diagnostic tool are 85 nations. The United States wrote the most articles on this issue than any other nation. There is a substantial growth in publications on this subject from one year to the next. Plos One is the journal where this topic has been covered the most. However, the top author profile who has published on this matter is from China. **Conclusion:** The attention to saliva research and its potential benefits for COVID-19 diagnostic tools is comparatively recent, but has developed substantially. The bibliometric analysis also could reveal the most recent research that has the potential to be expanded and deepened.

1 INTRODUCTION

Saliva is an oral fluid, produced by salivary glands, that continues to be studied as a promising diagnostic tool for oral and systemic diseases (Zhang *et al.* 2016). It contains antibodies, enzymes, growth factors, hormones, and other cytokines. Salivary testing has many advantages, especially because it is non-invasive, easy to collect, inexpensive, and uncomplicated manipulation (Javaid *et al.* 2016). Because saliva and blood include many of the same molecular components, both biofluids contain high concentrations of a wide variety of biological markers, including DNA, RNA, and proteins, as well as easily observable amounts of microorganisms (Marsh *et al.* 2016). Some viruses of large-scale infectious illnesses, notably respiratory disorders such as severe acute respiratory syndrome and middle east respiratory syndrome have been shown to be detectable in saliva (To *et al.* 2019).

COVID-19 outbreak has become the center of attention by many medical researchers around the world. Speedy and precise diagnosis is one of the keys to controlling the outbreak. The currently available diagnostic tool is based on the detection of antibodies or viral antigens through nasopharyngeal swabs. It is thought to be the most useful sample for diagnosing respiratory viruses, particularly SARS-CoV-2 (Ku *et al.* 2021). However, the

sample collection method is rather uncomfortable and expensive (Lai & Lam 2021). The necessity to extend SARS-CoV-2 testing capacity in a range of situations, combined with sample collection supply problems, has prompted a quest for alternate sample types with high sensitivity. Saliva is reckoned as a useful diagnostic fluid for regulating the spread of COVID-19 as a result of the large levels of SARS-CoV-2 RNA that are detected in the oropharyngeal cavity (Fernandes *et al.* 2020), (Lee *et al.* 2021). Following the validation test performed by Ku *et al.*, salivary testing even can be used for primary screening for SARS-CoV-2 (Ku *et al.* 2021).

The pathophysiological justification for saliva samples is based on the fact that the cellular receptor for SARS-CoV-2, angiotensin-converting enzyme II (ACE-2) is comparable to that of SARS-CoV (Zhou *et al.* 2020). Recent research has shown that salivary glands exhibit increased ACE-2 receptor expression (Xu *et al.* 2020). Chen *et al.* confirm the presence of ACE2 in salivary glands and demonstrate the feasibility of SARS-CoV-2 infection of the salivary glands (Jacimovic *et al.* 2021). Based on the local replication of the virus and the fact that fluids from the lower and upper respiratory tracts may mix in saliva, these results suggest that saliva may be a good and high-yield diagnostic sample for SARS-CoV-2 testing (Lee *et al.* 2021).

During the months leading up to the pandemic, a bibliometric study was carried out with the purpose of investigating the activity and trends of COVID-19 research within the area of dentistry. This study allows us to determine 296 scientific articles published during the first eight months of the pandemic. These articles reveal which individuals, research groups, institutions, and countries have contributed the most material. They also identify which journals have published the greatest volume of COVID-19 dental research, highlighting the primary research issues addressed as well as their level of empirical proof (Jacimovic *et al.* 2021). However, there is no particular bibliometric analysis that discusses the performance analysis of saliva as a COVID-19 diagnostic tool article. Therefore, this review aimed to identify and describe the scientific literature on the diagnosis of COVID-19 utilizing saliva as a diagnostic tool using bibliometric indicators. The saliva collection method is supposed to be more convenient and affordable for many people. As it will help in controlling the current pandemic situation, a bibliometric study about it would be needed.

2 MATERIALS AND METHODS

2.1 Literature search

The literature search was carried out using Scopus, a well-known expertly curated abstract and citation online database for academic literature. The data were accessed and retrieved on March 16, 2022. All publications regarding saliva as a COVID-19 diagnostic tool were extracted. Bibliographic data on saliva as a diagnostic tool for COVID-19 was searched by using the distinctive search interface of Scopus "Article title, abstract, and keywords." The following search terms by means of Boolean operators were "COVID-19" OR "covid" OR "sars-cov-2" OR "coronavirus" AND "saliva" AND "detection" OR "diagnostic tool" OR "diagnostic". Preliminary search resulted in a total of 814 documents. The inclusion criteria for this study are all types of documents but limited to the year of publication, which is 2019–2022. Decisively, 814 records consist of 603 journal articles, 111 review articles, 12 conference papers, 3 book chapters, and 85 others in letter, note, and editorial document type. All records were exported into comma-separated values (CSV) file for further analysis.

2.2 Data analysis and visualization

In this study, data analysis and visualization were carried out using various tools and software including VOSviewer (version 1.6.18), OpenRefine (version 3.5.2), and Tableau Desktop (version 2021.4.4). All data (in csv files) that has been extracted in Scopus were then cleaned up by keyword using OpenRefine. Then, the filtered data were constructed and

visualizing the bibliometric networks using VOSviewer. In this article, all graphical data displays were using Tableau Desktop software.

3 RESULTS AND DISCUSSION

3.1 Subject area

Of all 814 publications accessible, not all of them come from the health subject area. The top ten topics are as follows: medicine (32.2%), biochemistry, genetics and molecular biology (14.7%), immunology and microbiology (10.9%), chemistry (7.8%), engineering (6%), multidisciplinary (5.3%), environmental science as well as physics and astronomy (3.1%), whereas dentistry ranks ninth (2.9%), and tenth-rank discipline is chemical engineering (2.8%). Other remaining subject areas such as material science etc. about 10.2%.

3.2 Authors

The novel coronavirus SARS-CoV-2 outbreak, which began in Wuhan, China, has expanded fast since December 2019, generating a potentially fatal viral respiratory disorder known as COVID-19 (World Health Organization 2020). This remarkable event resulted in a significant increase in supporting publications concerning this condition from the end of 2019 to the present. The dentistry community has also agreed to emphasize research in this area in order to find answers to numerous crucial concerns about COVID-19, one of which is the use of saliva as a diagnostic tool.

At the end of 2019, only three articles had been published on the issue of saliva as a COVID-19 diagnostic tool. The number of publications on this issue jumped dramatically to 164 in 2020. Furthermore, the number climbed to 542 articles in 2021. In the initial quarter of the year 2022, 105 articles have already been published (Figure 1). Plos One is the journal that has addressed this topic the most ($n = 31$). Furthermore, the journal Biosensors and Bioelectronics is the second ($n = 26$) followed by Scientific Reports ($n = 22$), Journal of Medical Virology ($n = 21$), Journal of Clinical Microbiology ($n = 19$), Journal of Infection ($n = 18$), Journal of Clinical Virology ($n = 15$), Microbiology Spectrum ($n = 15$), and Diagnostics ($n = 14$) (Figure 2).

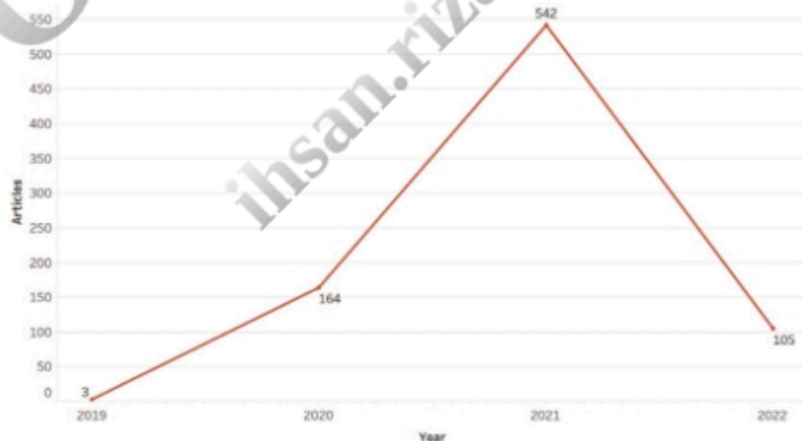


Figure 1. The annual number of Scopus documents (2019–2022) relevant to saliva as a diagnostic tool.

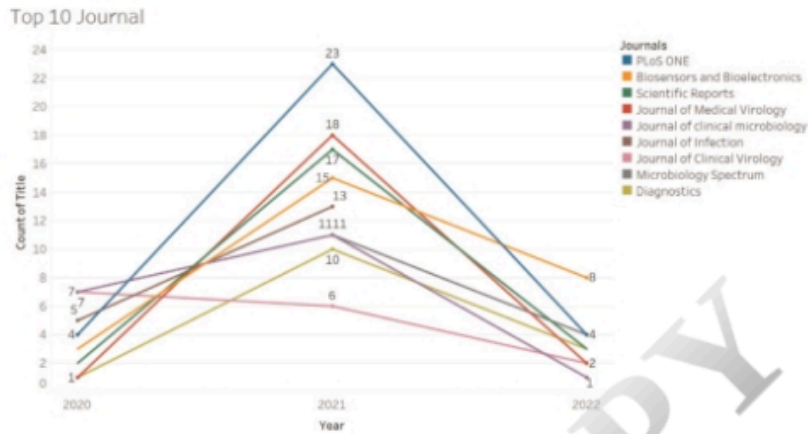


Figure 2. The top 10 journals per year (2019–2022) where the topic of saliva as a diagnostic tool has been covered the most.

3.3 Country

There are 85 countries that participated in writing articles on saliva as a COVID-19 diagnostic tool (Figure 3). The authors of these articles are dominated by countries from the Americas, Europe, and Asia. The 10 countries that wrote the most articles on this topic were the United States (253 articles) followed by China (57 articles), Italy (56 articles), Canada (54 articles), India and the United Kingdom (51 articles), Japan (48 articles), Brazil (47 articles), Germany (42 articles) and France (32 articles). In accordance with the highest number of confirmed cases of COVID-19 worldwide, the United States has contributed the most to COVID-related publications (World Health Organization 2020).

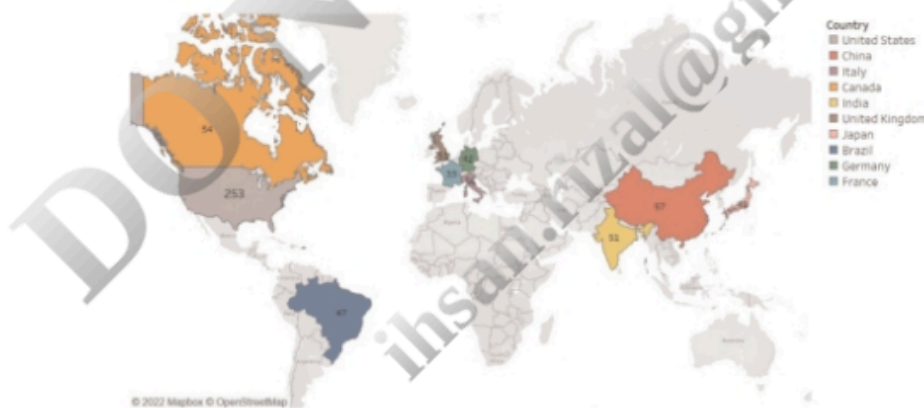


Figure 3. The top ten countries that published the most articles on the topic of saliva as a diagnostic tool.

3.4 Citation

There was a total of 7,870 citations for the papers that were analyzed (Figure 4). The most cited article was “Temporal profiles of viral load in posterior oropharyngeal saliva samples and serum antibody responses during infection by SARS-CoV-2: an observational cohort study” in *The Lancet Infectious Diseases* by To *et al.* The article was cited 923 times. One of

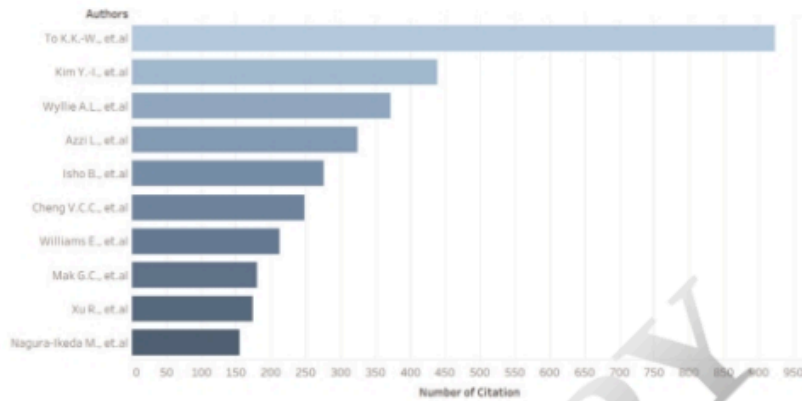


Figure 4. The top ten authors in the Scopus database with the most citations on the subject of saliva as a diagnostic tool.

the most important findings of the study was that salivary viral load was highest in the first week after the onset of symptoms and then reduced over time. In addition, it was said that posterior oropharyngeal saliva samples are a non-invasive specimen that is more acceptable to patients and medical personnel (To *et al.* 2020). The second most cited article is an animal experiment to better understand the *in vivo* characteristics of SARS-CoV-2. This study was cited 439 times. It discovered that ferrets infected with SARS-CoV-2 excreted the virus in nasal washes, saliva, urine, and feces for up to 8 days after infection (Park *et al.* 2020) Research done by Azzi *et al.* even says for certain that saliva is a reliable biological fluid that could be a candidate for a rapid diagnostic test (Azzi *et al.* 2020).

According to the knowledge of the authors, this is the first report to identify and describe the scientific literature on the diagnosis of COVID-19 utilizing saliva as a diagnostic tool using bibliometric indicators. However, this study has limitations, such as the inclusion of all available modes of publishing and the exclusion of potentially relevant articles published in Chinese, despite the fact that the leading author profile on this topic is from China. Regarding these limitations, we consider the data reported in this study to provide objective evidence about saliva research and its potential application in the COVID-19 screening tool.

4 CONCLUSION

The interest in saliva research and its potential benefits for COVID-19 diagnostic tools is relatively new, although it has grown significantly. The bibliometric analysis also indicate the most recent research that has the potential for expansion and elaboration.

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