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Abstract

Systematic Review on Biosensor Systems for COVID-19 Aerosol Detection †

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Abstract: Timely detection and diagnosis are crucial for outbreak measures and infection control. This review discusses the types of biosensor systems developed so far for the detection of COVID-19 aerosols in the air for the risk assessment and identification of gaps in the field. Data were collected from four academic databases, including IEEE Xplore, Scopus, Web of Science, and MDPI. The results suggest the development of very few sensors for the aerosol detection of COVID-19, and most of the sensors are immune based.

Keywords: SARS-CoV-2; biosensor systems; systematic review; aerosol; detection; air monitoring

1. Introduction

Biosensors are analytical devices that each incorporate a biological sensing element to detect a targeted analyte from complex samples. A bio detection device consists of some distinct components: a bioreceptor, a transducer, and a system for signal processing [1]. The biosensor application for risk assessment can help in alleviating the risk of transmission prior to the person's exposure to the virus [2]. In this review, the types of biosensor systems that have been used the most for the detection of the aerosols have been discussed under the following sections: Materials and Methods; and Discussion.

2. Materials and Methods

2.1. Data Sources

From the data sources, namely IEEE, Scopus, MDPI, and Web of Science, 1691 articles were collected based on the different search strings mentioned in Table S1. Then, the articles were filtered and screened according to the research questions mentioned in Table S2.

2.2. Search Strategy and Study Selection

The selection process aimed to identify the articles most relevant to the study's research questions with the help of the eligibility criteria mentioned in Table S3. A total of 1691 studies were reviewed from 2020, 2021, and August 2022. Each article was evaluated by two authors, who discussed its title, summary, and keywords. After finding the articles, duplicates were removed, and extensive searches were conducted to filter out unrelated publications. The focus of the research is COVID-19 aerosol detection, which is gaining interest from researchers and scientists. Figure 1 displays the study selection stages and activities during each research phase.

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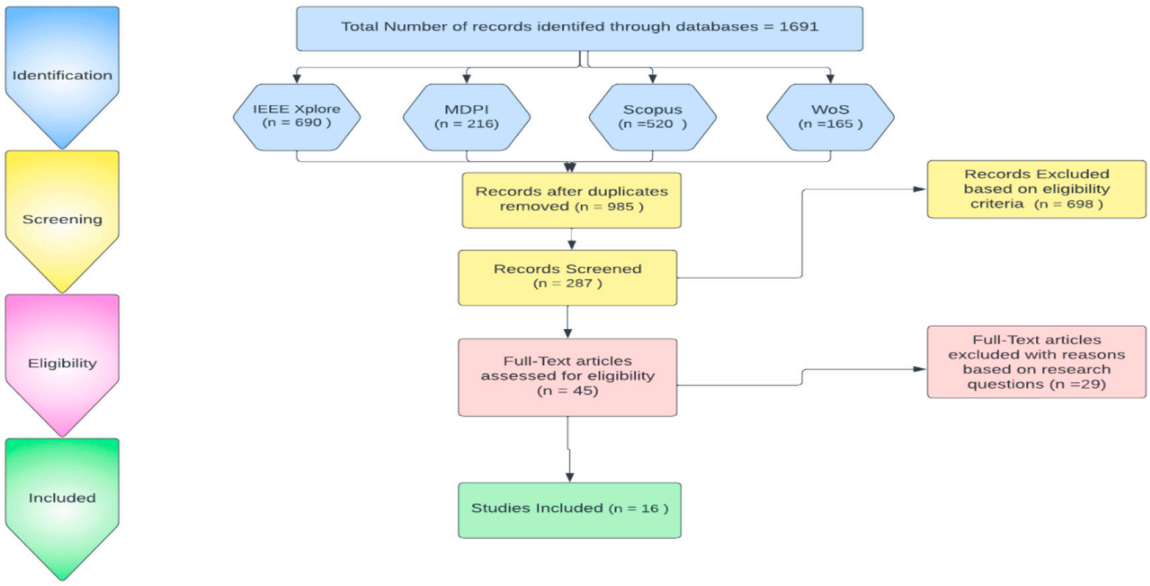

Figure 1. Study Selection Flow Diagram.

3. Discussion

3.1. Results Based on Types of Sensors, Geographical Distribution, and Data Sources

Figure 2 represents the types of data sources while Figure 3 depicts the different types of sensors used for aerosol detection, out of which the immunosensors are the most used compared to others. Furthermore, in terms of geographical distribution (Figure 4), the country with the highest number of articles published is the USA, while the search engines (Figure 2) with the highest number of studies are as follows: MDPI, followed by Scopus [3–18].

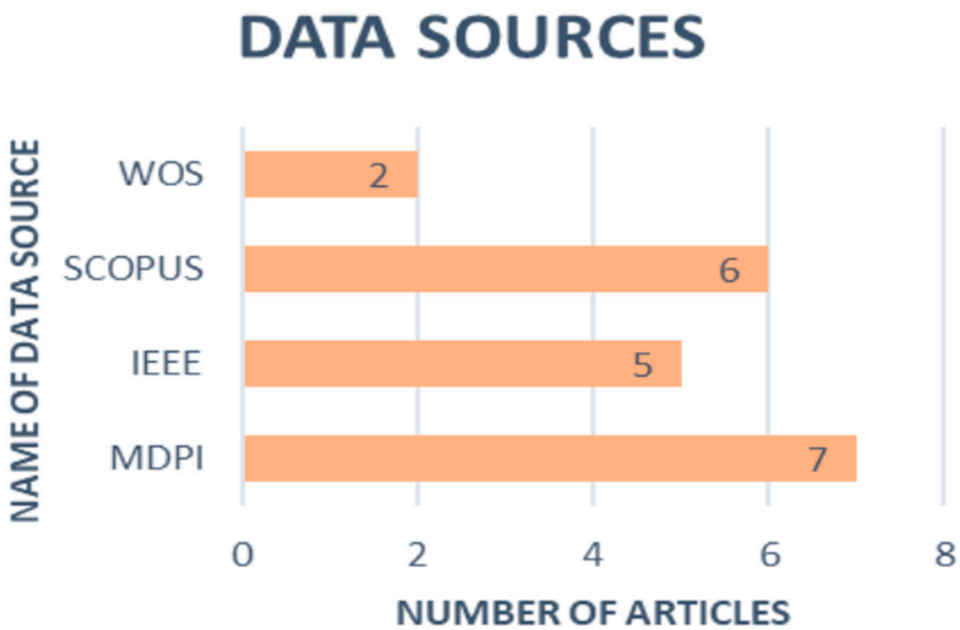

Figure 2. Types Of Data Sources.

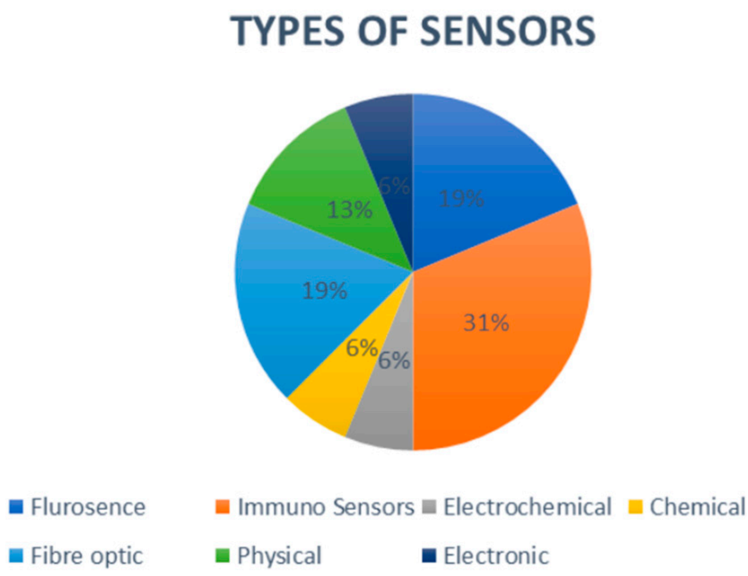

Figure 3. Types of sensors.

Figure 4. Geographical Distribution of the articles.

3.2. Based on Co-Occurrence of Authors and Keywords

The co-occurrence of keywords and authors, carried out by VOS viewer software network visualization, depicts the following: the most common keywords are COVID-19, followed by machine learning and predictive models (Figure 5), and the authors show five clusters of co-authorship with the threshold of four authors per article (Figure 6).

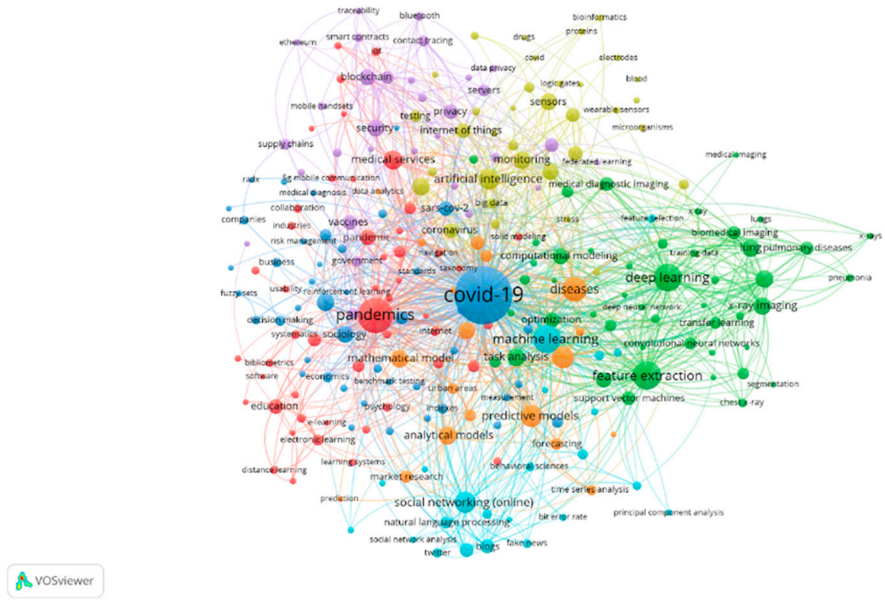

Figure 5. Co-occurrence of keywords.

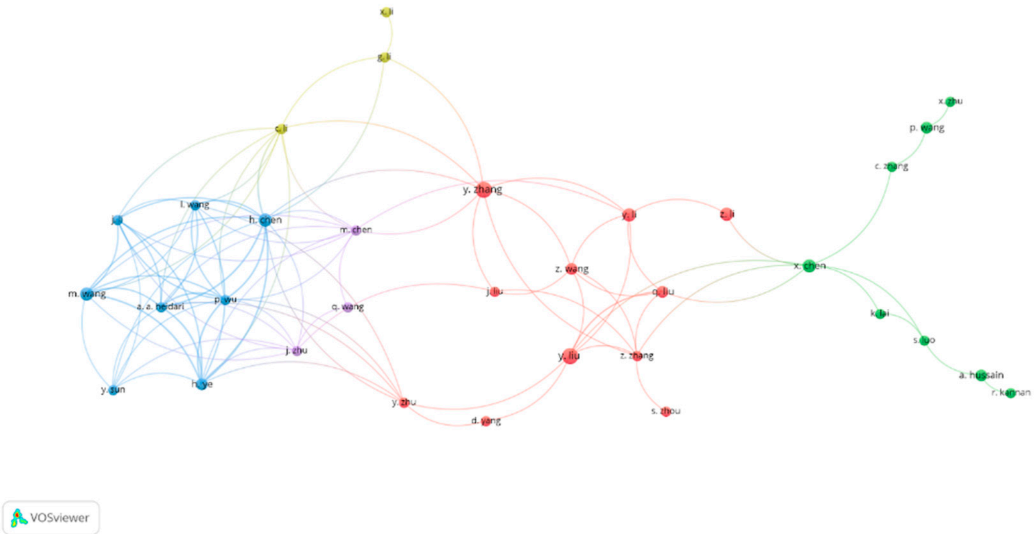

Figure 6. Co-Authoship of the authors.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/proceedings2024097203/s1.

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