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# A Scientometric Analysis of Chronic Obstructive Pulmonary Disease

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***Abstract :*** Chronic obstructive pulmonary disease (COPD) is a common lung disease that causes restricted airflow and breathing problems. According to a report by the World Health Organization (WHO), chronic obstructive pulmonary disease (COPD) is the third-leading cause of death worldwide.

For conducting a scientometric analysis of research on a total of 4518 publications between 2001 and 2023 from the PubMed database using exercise and COPD as keywords.

This scientometric analysis research is to provide a comprehensive overview of the scientific literature on exercise in COPD and to find the following publication trends,collaboration patterns between the authors, countries, universities, and co-occurrence patterns between the authors, keywords, and journals.

Findings of major publications from the United States, followed by China and other countries, have limited contributions to this research. The International Journal of Chronic Obstructive Pulmonary Disease, with a count of 498, is the most published manuscript in the COPD field, and the Imprial College of London contributed to most of this COPD research. This analysis can help identify key researchers, institutions, and research topics, leading to a better understanding of the current state of COPD research and potential areas for future exploration.

***Keywords- Chronic obstructive pulmonary disease,Authors,Countries,Lungs,COPD,Exercise***

## 1 .INTRODUCTION

Chronic obstructive pulmonary disease, or COPD, refers to a group of diseases that cause airflow blockage and breathing-related problems. Symptoms may be mild at first, beginning with intermittent coughing and shortness of breath. As it progresses, symptoms can become more constant, and it can become increasingly difficult to breathe. It is a major health concern worldwide, leading to significant morbidity and mortality. Exercise has been recognized as an essential component of COPD management, as it can improve exercise capacity, reduce dyspnea, and enhance the overall quality of life for individuals living with the disease. Scientometric analysis has emerged as a powerful tool for exploring research trends, identifying key contributors, and mapping the landscape of scientific literature in a specific field. In this study, I am to perform a scientometric analysis focused on the topic of exercise and chronic obstructive pulmonary disease. To analyze the scientific status of chronic obstructive pulmonary disease to increase research and predict future trends in COPD. The scientometric analysis involves a descriptive evaluation of published research papers, an analysis of collaboration patterns between the author, country, and universities, and co-occurrence patterns between the authors, keywords, and sources, as well as the overall growth of COPD research over time.This analysis used by researchers and medical professionals to keep advancing the role of exercise in controlling and enhancing the quality of life for those who suffer from this chronic respiratory disease by analyzing patterns in scientific publications.

## 2 .LITERATURE REVIEW

A bibliometric analysis of exercise interventions for COPD over the past 22 years provides direction for future research.The study suggests that the number of papers published in this field will continue to increase in the future[1]. Their used bibliometric analysis to understand the research progress regarding immune function in COPD. Meanwhile, we found that the hotspots of COPD immunology in basic research focus on the analysis of etiology and risk factors, and the exploration of the immune system; and the hotspots of COPD in clinical research focus on epidemiology, and the prevention and management of different subtypes of COPD[2].This study provides not only the research status and hot spots, but also the trends and frontiers of research on PR, and in some sense, it may provide some new directions for future research in this field[3].The results of this study could provide useful information for pulmonary rehabilitation researchers, funding agencies, and health managers[4].This bibliometric analysis provided new guidance for the development of the field of COPD and lung cancer comorbidity by visualizing current research hotspots, and predicting possible hot research directions in the future[5].

This bibliometric analysis provides a historical perspective on the progress of scientific research on COPD. Articles originating from the United States and published in high-impact specialized respiratory journals are most likely to be cited in the field of COPD research[6]. The administration of bronchodilators and pulmonary drug delivery systems, as well as consideration of elderly COPD patients remained the hotspots, while triple therapy and comorbidity of COPD, as well as the prevention and treatment of elderly COPD patients had been frontiers in recent years[7].This study is the first bibliometric study to analyze publications on COPD and COVID-19 around the world, and it demonstrates the trends and characteristics of related studies, providing researchers with useful

bibliometric analysis for further studies, which may help researchers to deepen their understanding of the disease under the epidemic and provides us with references to further optimize disease management measures, and then it may reduce the adverse effects of the epidemic on COPD patients[8].The research on pyroptosis in lung disease is in its growth stage. The information released in this article may help researchers better understand the hotspots and developmental trends in this field, the cooperation network information of authors, countries, and institutions, and the citation correlation between articles[9].A periodic evaluation of the top cited articles can help researchers identify the quality of work in respiratory system and pinpoint subtopics which have not been given due consideration[10].

## 3 .MATERIALS AND METHODS

### 3.1 Search Strategy

For every publication that was searched for in the Pubmed database, it extended the deadline for retrieving published papers from January 1, 2001, to December 31, 2023. "TI = exercise AND chronic obstructive pulmonary disease" is the data search technique.

### 3.2 Analytical Tools

The R-Studio 4.3.2 version is a powerful integrated development environment (IDE) for R, a programming language widely used in data analysis and statistical computing. In scientometric analysis, RStudio can be a valuable tool for processing and analyzing large datasets related to scientific publications, co-occurrences, and collaborations. The Bibliometrix package is designed for scientometric analysis. It provides functions for data import, cleaning, visualization, and marketing, making it easier for researchers to conduct comprehensive scientometric studies.

## 4 .RESULTS

### 4.1 Annual Publication outputs

From 2001 to 2023, a total of 4218 publications met the inclusion criteria. By analyzing annual production data for COPD, researchers can gain insights into the growth of COPD. These results suggest that interest in exercise and COPD continues to grow, and the intensity of research will continue to increase Figure4.1.

### 4.2 Collaboration Networks Between Countries

Analyzing collaboration networks for the analysis of countries can provide valuable insights into the global landscape of research collaboration and knowledge exchange.The 4218 articles were published in 91 countries. For better visualization, to be only selected 20 countries. Each node represents a country, and the size of the node represents the number of posts in that country. The larger the node, the greater the number of articles published in this field in that country. In addition, the lines between the nodes represent the connections between countries, and the closer the connection, the more countries or regions are presented on the world map in Figure 4.3.

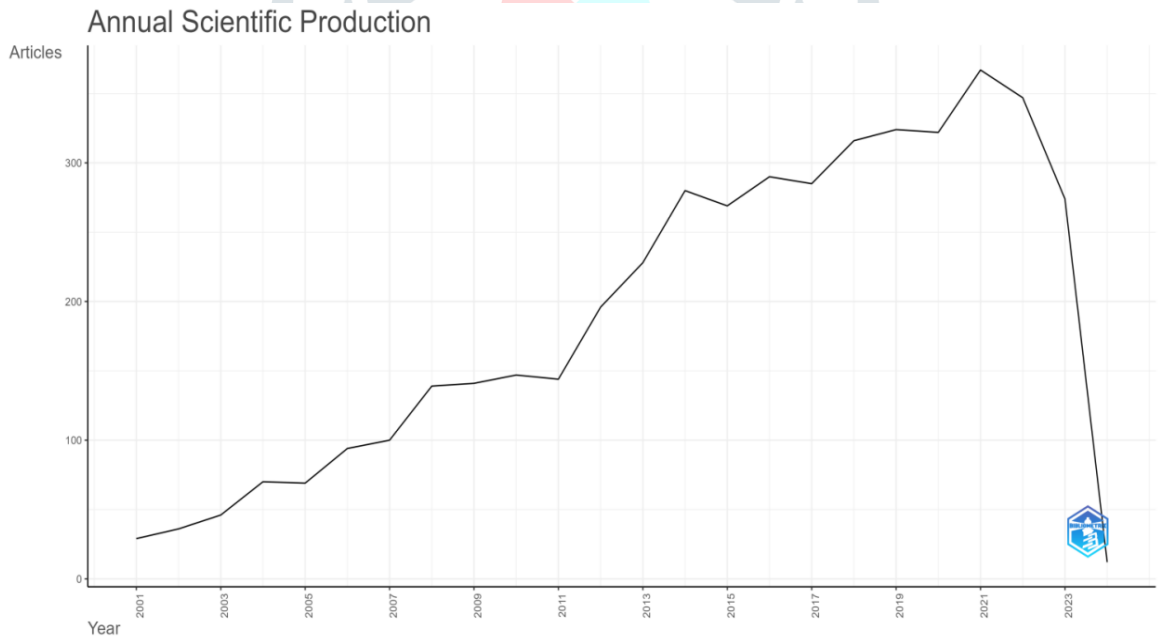


**Figure4.1**.Journal publication between 2021 and 2023

The list of the top 5 countries is presented in Table 4.1. Assessing the centrality of countries within collaboration networks can help identify influential players that act as hubs for research collaboration and knowledge dissemination. Countries with high centrality scores are likely to play a crucial role in connecting researchers from different parts of the world. The highest count and centrality are obtained from the USA .In scientometric analysis, the ranking of countries plays a significant role in understanding the scientific output, impact, and collaboration patterns of different nations.

**Table 4.1** The 5 Most Active Nations by Journal Publication Count and Centrality

| Rank | Country | Count | Centrality |
|---|---|---|---|
| 1 | United States | 441 | 1.90 |
| 2 | China | 290 | 0.13 |
| 3 | Brazil | 231 | 0.35 |
| 4 | Canada | 226 | 1.62 |
| 5 | Australia | 203 | 1.29 |

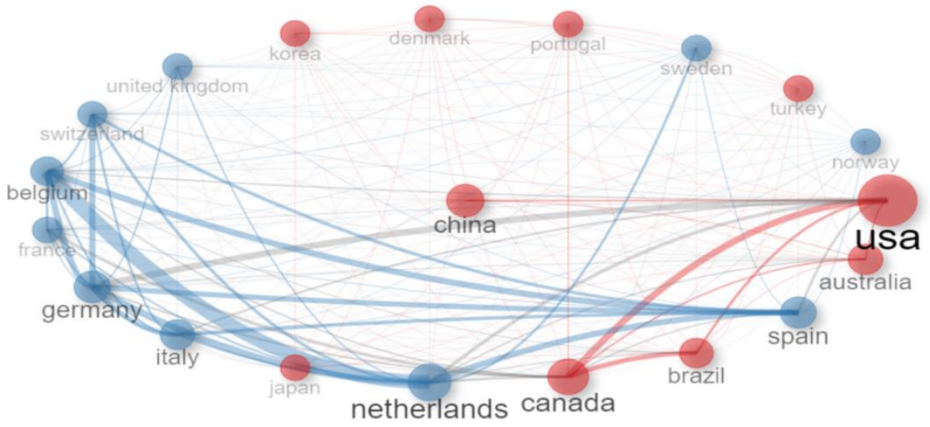


**Figure 4.2** Collaboration Networks between Countries

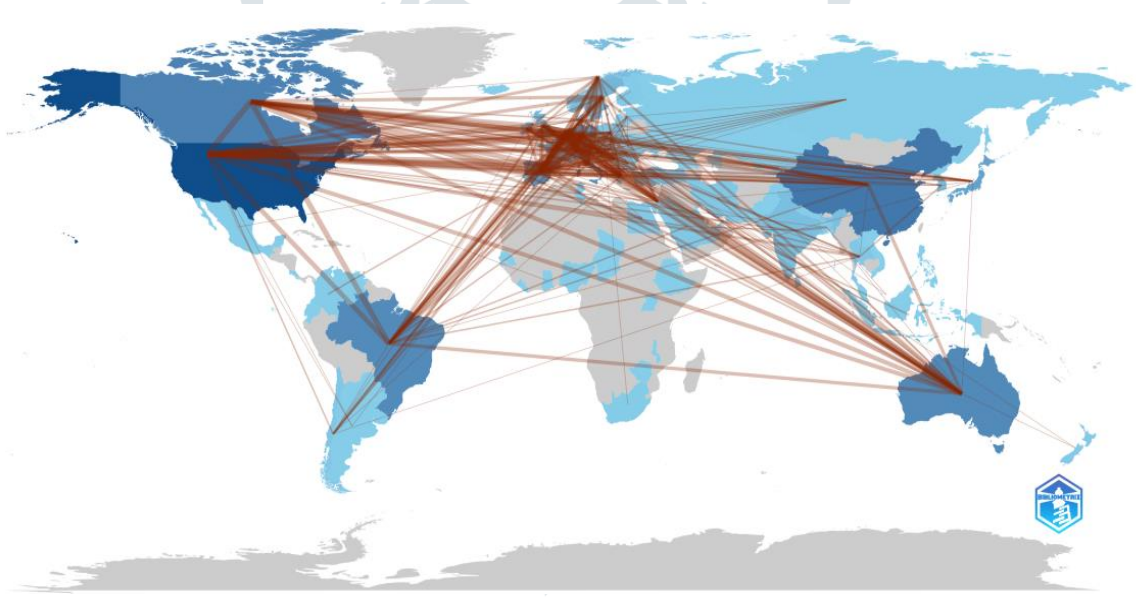

**Figure 4.3** Country Collaboration Map

**4.3 Collaboration Networks Between Institutions**

Analyzing institutions through scientometric analysis provides valuable insights into their research productivity, international collaboration, and overall contribution to the advancement of knowledge in various disciplines.

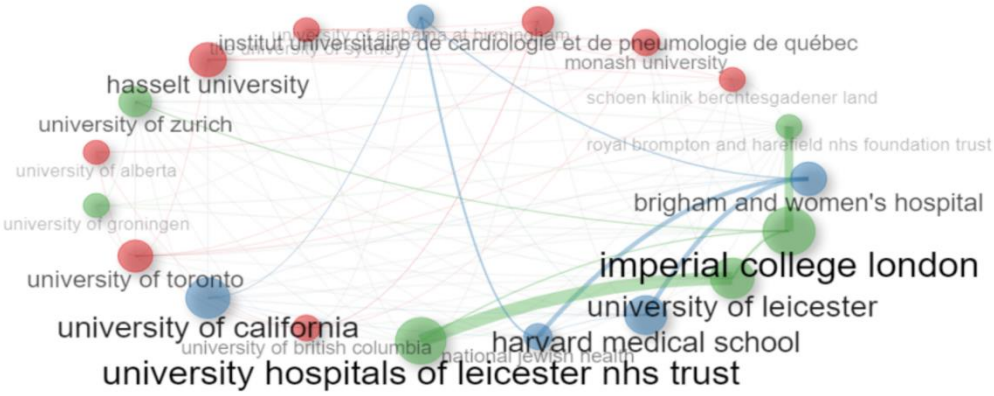


**Figure 4.4.** Collaboration Networks between Institutions

Institutional rankings in scientometric analysis help identify leading research institutions, highlight emerging centers of excellence, and showcase collaborative networks within the scientific community. The list of the top 5 institutions is presented in Table 2. Imperial College London has published the largest number of publications, second the University of Leicester, third Brigham and Women's Hospital,next Harvard Medical School, followed by National Jewish Health.

**Table 4.2**. The best five running institutions in publications

| Rank | Institution | Centrality |
|---|---|---|
| 1 | Imperial College London | 0.12 |
| 2 | University of Leicester | 0.2 |
| 3 | Brigham and women's Hospital | 0.14 |
| 4 | Harvard Medical School | 0.2 |
| 5 | National Jewish Health | 0.2 |

### 4.4 DISTRIBUTION OF JOURNALS IN PUBMED

A total of 625 sources published papers on exercise and COPD. Table 3 shows the top 10 academic journals publishing articles related to exercise and COPD research. The International Journal of Chronic Obstructive Pulmonary Disease led the way with 498, followed by Respiratory Medicine with 350, The European Respiratory Journal with 275, Chronic Respiratory Disease with 173, Respiratory Care with 167, BMC Pulmonary Medicine with 107, Journal of Applied Physiology with 105, Plos One with 96, Respiratory Research with 95, and Thorax with 90 counts. The highest impact factor was the third-ranked European Respiratory Journal (IF = 24.3).

**Table 4.3** The Most Popular Research Publications

| Rank | Publications | Journal | Impact Factor |
|---|---|---|---|
| 1 | 498 | International Journal of Chronic Obstructive Pulmonary Disease | 2.9 |
| 2 | 350 | Respiratory Medicine | 4.582 |
| 3 | 275 | The European Respiratory Journal | 24.3 |
| 4 | 173 | Chronic Respiratory Disease | 3.6 |
| 5 | 167 | Respiratory care | 2.8 |
| 6 | 107 | BMC Pulmonary Medicine | 3.5 |
| 7 | 105 | Journal of Applied Physiology | 3.532 |
| 8 | 96 | Plos One | 3.7 |
| 9 | 95 | Respiratory Research | 5.631 |
| 10 | 90 | Thorax | 9.203 |

### 4.5 Collaboration Networks Between Authors

Analyzing authors' scientometric data involves evaluating various metrics related to their scholarly output, impact, and collaboration patterns. Overall, 4218 publications on exercise and COPD were published by 16883 authors. Each node represents an author, and the larger the node, the more papers are published. The connections between nodes represent cooperation, and the more extensive the connections, the closer the cooperation in Figure 4.6. The most published author is Spruit Ma with a count of 89, followed by Maltais F with an 85. The list of the top 5 authors is presented in Table 4.5.

**Table 4.5** .Top 5 Authors with Count and Centrality in COPD Publications

| Rank | Author | Count | Centrality |
|---|---|---|---|
| 1 | Spruit Ma | 89 | 0.25 |
| 2 | Maltais F | 85 | 0.25 |
| 3 | Singh SJ | 83 | 0.2 |
| 4 | Polkay Mi | 77 | 0.23 |
| 5 | O'Dennel De | 72 | 0.16 |

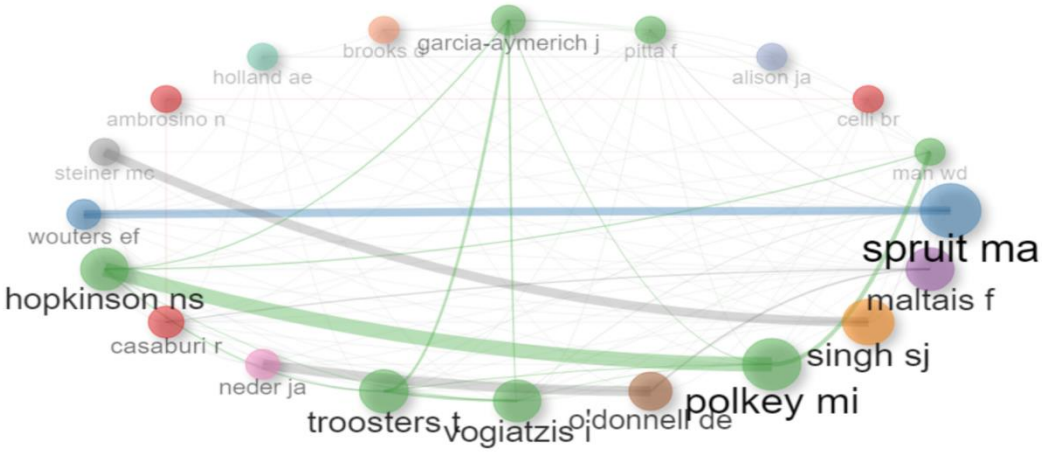


**Figure 4.5** Collaboration Networks Between Authors

### 4.6 Co-Occurrence of Keywords

In scientometric analysis, the analysis of co-occurring keywords involves identifying and examining the patterns of keywords that frequently appear together in scientific publications within a specific research domain. From 2001 to 2023, a total of 6175 keywords appeared in the fields of exercise and COPD. They limited the keywords I used to those with at least 20 publications in order to get a better visualization, (Figure 4.6).

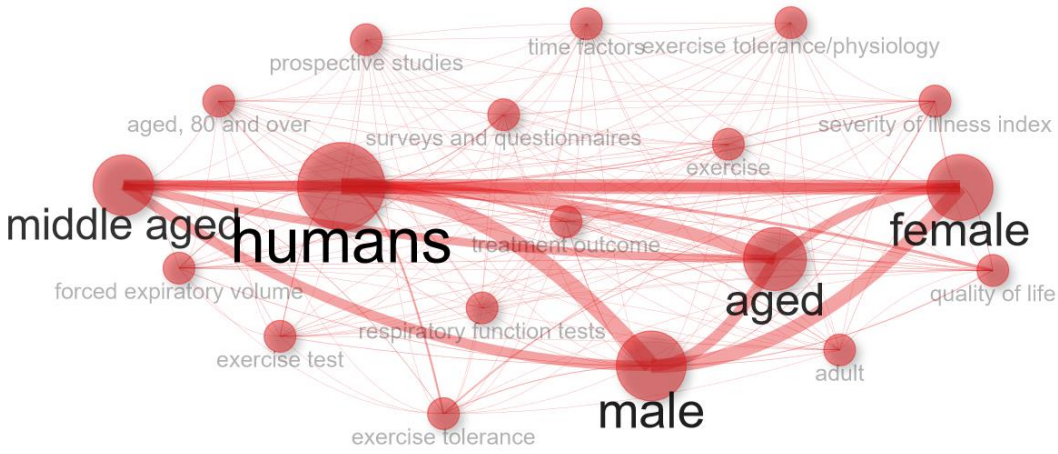


**Figure 4.6.**Co-Occurring Keywords

Keywords analysis in scientometrics involves examining the frequency, co-occurrence, and trends of specific terms or phrases used in scientific publications to identify important topics, research areas, and emerging trends within a particular field of Exercise and COPD. The list of the top 10 keywords is presented in Table 4.5.

**Table 4.5**. Most Frequent Words

| Rank | Occurrences | Keywords |
|---|---|---|
| 1 | 3831 | Humans |
| 2 | 2373 | Male |
| 3 | 2193 | Female |
| 4 | 2052 | Aged |
| 5 | 1925 | Middle aged |
| 6 | 994 | Quality of life |
| 7 | 817 | Exercise and tolerance |
| 8 | 716 | Treatment Outcome |
| 9 | 575 | Exercise test |
| 10 | 568 | Severity of illness index |

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The most frequent trending topics be presented in Figure 4.7. The large circle is represented by more than 3000 frequencies, the middle circle is represented by more than 2000 frequencies, and the small circle is represented by more than 1000 term frequencies.

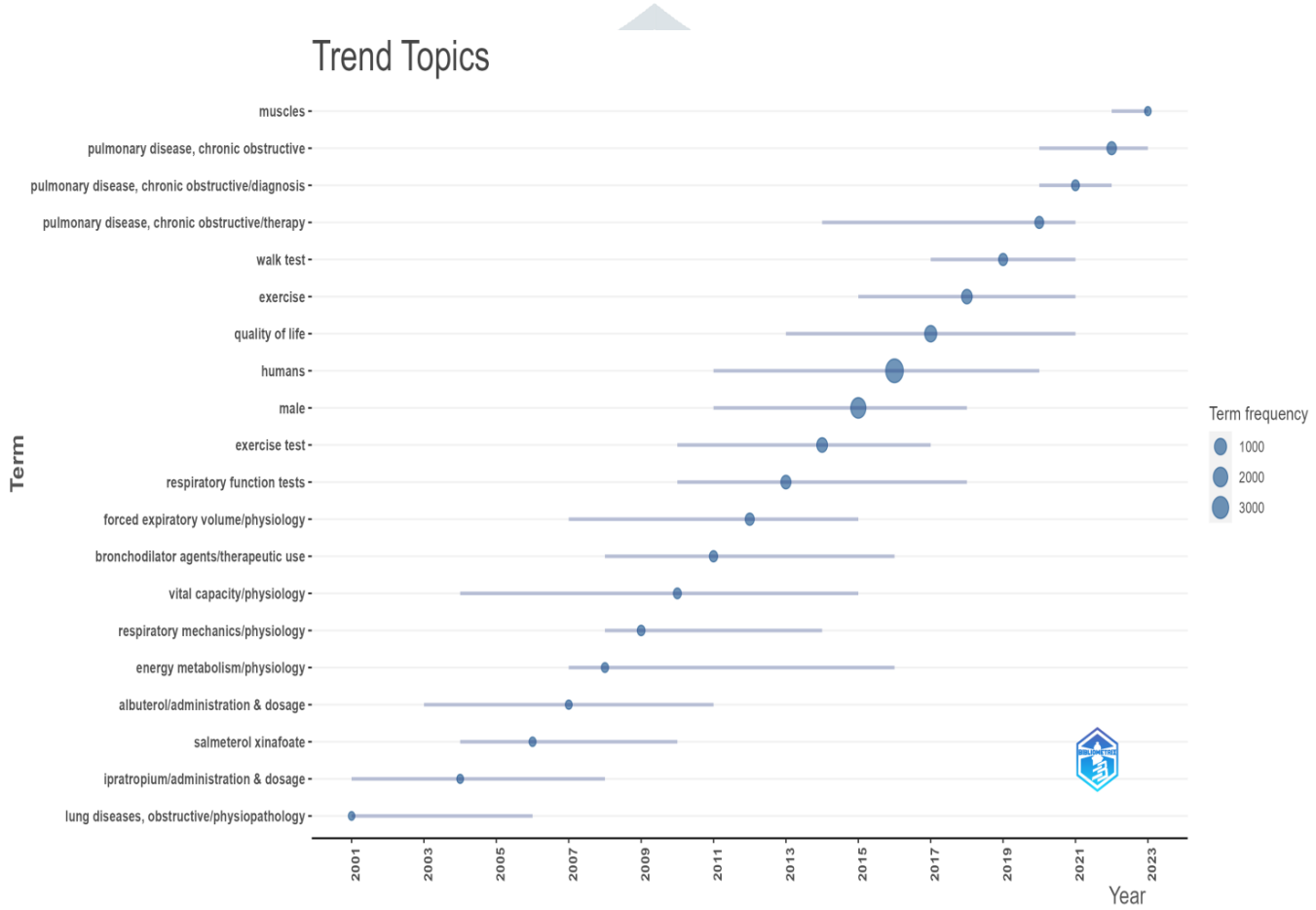


**Figure 4.7**. Most Trending Topics

## 5 .STRENGTH AND LIMITATIONS

The research status on exercise and COPD is described in this study by means of nations, institutions, journals, authors, keywords, co-occurrence, etc.This offers a wealth of information from multiple perspectives, showing present and future directions for this COPD research. The major limitation is that citations and co-citations are not captured in this PubMed database. In future this work would be extended to Web of Science and Scopus for an empowerment.

## 6 .CONCLUSION

This study analyzed trends and hot spots in exercise and COPD research from 2001 to 2023 using the Pubmed database. According to the study, there will likely be an increase in the number of articles produced in this field in the future ahead.The largest countribution to research on exercise and COPD have been come from United States.The International Journal of Chronic Obstructive Pulmonary Disease, with a count of 498, is the most published manuscript in the COPD field, and the Imprial College of London contributed to most of this COPD research .This scientometric analysis is used by future researchers and the medical field to determine how to reduce COPD death count.

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