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Sivankalai S
*PSN College of Engineering & Technology*, skysivan@gmail.com

K Sivasekaran
*Ayya Nadar Janaki Ammal College, Sivakasi, Tamilnadu*, sivasekarank@gmail.com

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# Mucormycosis (Block Fungus) Maiming Covid Patients: Scientometrics analysis through prism of Biblioshiny

Sivankalai, S and K. Sivasekaran
[1]Librarian, PSN College of Engineering and Technology, Tirunelveli, India. E-mail: skysivan@gmail.com. Orcid Id: 0000-0002-1174-7594
[2]Librarian, Ayya Nadar Janaki Ammal College, Sivakasi, India. E-mail: sivasekarank@gmail.com.
Orcid Id: 0000- 0003-0021-7819

## Abstract

This study analyses the global level outlook of research publications on Mucormycosis output between the period of 1923 to 2021 (May) on different limitations including contribution of authors, communication channel, publications on Institutions, countries, Journals, cited articles and mode of languages. 4451 data was downloaded from core collection of Web of Science bibliographic database using the search term 'Mucormycosis' and limited the publications 1900 to 2021, first publication was started in 1923 onwards. 3798 institutions and 8562 different disciplines contributed and 2808 records are in Articles. 4451 records published by 17320 authors and 23552 collaborated authors, documents per author are 0.257, authors per document are 3.89 and co-authors per document are 5.29. First article in German language with two authored in 1923, single authored documents are 287 and 74 authors contributed a single article in this topic. Total records published in 1161 journals with 11 languages from 95 countries in the Globe and 1504 are open access and 12 articles are highly cited in this field.

**Keywords: Mucormycosis, Black Fungus, Covid, Scientometrics, Zygomycosis, Infectious Diseases.**

## Introduction

Mucormycosis is a very rare infection that is caused by exposure to Mucor. It is one which is commonly found in soil, plants, manure and rotting fruits and vegetables. This mucor mould is referred to as mucomycetes. The moulds are found in decaying organic matter such as leaves, rotten wood etc. Mucormycosis is a hostile, opportunistic infection caused by fungus in the right place to the class of Phycomycetes. Rhino-occulo-cerebral mucormycosis is the frequent anatomical appearance of mucormycosis and is a potentially incurable disease (Mohanty, 2010). Mucormycosis is a horror clinical thing caused by filamentous fungus of the sort Mucorales mostly affecting individuals of immune compromised and it involves par-nasal sinuses, orbit, lungs and gastrointestinal systems. Early detection, multidisciplinary involvement and timely intervention to use of local antibiotics to save the cause by affecting ear and neck (Kancharu, 2020). The symptoms of mucormycosis are fever, headache, reddish and swollen skin over nose, visual problems, facial pain and eyes swelling etc. In the early stages, pain in the chin and eye areas and bleeding from the nose should be treated by a doctor immediately. Nasal mucormycosis usually affects individuals with inadequately controlled diabetes, perpetually very wide, but in some patients, it can present in chronic lazy form and unusual opportunistic infection of the nasal hollow space and par-nasal sinuses sourced by saprophytic fungus which can quickly direct to demise (Wadhera, 2020). Also,

toothache, blurred vision, and fever may occur. Symptoms of mycorrhiza include chest pain and difficulty breathing. The comforting thing is that the disease is not contagious. Zygomycetes is one of the general classes of fungus that cause mucormycosis, Mucoraceae are found in the ecosystem responsible for initiating and decaying most organic material. Infection develops because of some unusual circumstance that places the fungi in contact with injured animals or humans. Fungi attack us when our body's immune system is weakened. The body's ability to fight fungi decreases while taking medication for another sickness, fungal infections occur at that time. There are three types of this infection like pulmonary (lung) mucormycosis, symptoms include fever, coughing, shortness of breath. Renal mucormycosis, symptoms are fever, frank pain cutaneous mucormycosis. At the initial stage skin becomes reddish and swollen adjacent to trauma that finally results in ulcer. G1 Mucormycosis in bloody and sometimes dark vomits and abdominal pain etc. Diagnosing of this problem, CT or MRI tests helps to find the extent of infection or tissue destruction. The disease, which occurs in the nose area, quickly spreads to the throat, eyes, and brain. This can lead to many people having to have their eyes surgically removed. The infection reaches the brain and becomes a life-threatening disease. Tissue obtained by surgical removal of infected tissue may identify the fungus and help make the definitive diagnosis. Treatment of mucormycosis is to be done to slow or halt the fungal spread called antifungal medications. Amphotericin B is the drug to treat antifungal disease and Posaconazole can also treat fungal diseases. The comforting thing is that the disease is not contagious. Weakness only occurs when the resistance is low and seeks medical attention immediately if symptoms occur to prevent this one. Fungi particles in the air enter the body when people with low immunity inhale and infect the sinuses and lungs. This weakness carries the risk of death if left untreated. The patients had diabetes mellitus caused by rhino-orbital-cerebral mucormycosis connected with COVID-19 infection. To further risk issues for opportunistic fungal infection survive in COVID-19 patients including automatic ventilation and Sars-CoV-2 persuaded immune suppression. The role of ophthalmologist's can be important in the early finding of mucormycosis allied with COVID-19 (Dallalzadeh, 2021). People who are severely affected by the corona and are being treated in the Intensive Care Unit are being prescribed more powerful drugs called steroids thus coming out of the corona, but within two weeks after that they became black fungus. Doctors suggested that the level of stereo drugs taken is not more. Experts say that one way to prevent fungal infections is to make sure that the right amount of steroids are given to corona patients during and after treatment and patients have been warned that they need to monitor their sugar levels.

## Literature Reviews

**Prakash and Chakrabarti (2019)** have analyzed that in recent years, the observations of changes in epidemiology of mucormycosis have been increase in frequency, new contributory agents and the vulnerable population. Globally the rise has been perceived, but Asian countries is very high than other countries. While diabetes mellitus outshine all other risk aspects in Asia, chronic renal failure and post-tuberculosis has appeared as new risk groups. The patients with diabetes mellitus have the majority observe of the rhino-cerebral form of mucormycosis, whereas, hematological malignancy and transplant recipients patients of pulmonary mucormycosis. **Petrikkosetal. (2012)** have described mucormycosis has come out as the most frequent invasive mycosis in order of significance the patients after aspergillosis and candidiasis with hematological

and allogeneic stem cell transplantation. Mucormycosis is a risk in patients with diabetes mellitus in the Globe. The patients of developed countries like India have more and more infected with unrestrained diabetes and trauma. The capability of identify the burden of disease is partial because the data on epidemiological of mycosis are limited. It can be categorized as six forms on anatomic localization, Rhinocerebral, pulmonary, Cutaneous, Gastrointestinal, Disseminated and uncommon presentations. **Senet.al. (2021)** have discussed impact on mucormycosis in the eye and the effect of other parts of the human body. They have investigated and delivered the brief information about ophthalmologists recognize the potential manifestations and the stage of the viral infection when they usually appear. Ophthalmologists world in excess of exposing various symptoms of the disease in the eye. The infection can range from asymptomatic, mild to life threatening respiratory suffering, the lists of reasons of general ophthalmic pathologies added covid-19 has clarified. It can damage all the organs of the body like the nerves, vessels and other structures for pathology. They can expect to see high manifestations of the illness in the eye and even groups of similar cases. **Sivankalai, et.al. (2021)** have examined publications output on Astrovirus data (2000-2019) obtained from the web of science and tabulated using the R package of biblioshiny. They got 1113 documents, analyzed most recurrent words, collaboration and citations of authors and countries, calculated h-index, g-index and m-index of the authors. 8.86 percent of growth rate per year, multi authored and country publications higher than single author's and country publications. Average annual document citation was 26.17 and 16319 references. Journal of medical virology published 17 papers, 972 of articles and 7477 authors appeared in this research. **Chithiraivel, Sivasekaran and Jeyshankar (2020)** have explored the research publications output of Eosinophilia in global. Used web of science databases between the years 1998 and 2017 and got 12,118 publications. Researchers and scientists favour the journal publications, the year 2016 has published 793 publications. Further they have tabulated literature growth, participating authors with Hirsch index, doubling time of growth, publications, impact factor and citation of journals and different subject fields. **Surulinathi, karthick and Balasubramani (2020)** have described the results of Hantavirus scientometric study in the period of 1984 to 2020 (March). They indicated 10152 authors published 3678 papers with 86204 citations from 122 nations. The highest publication of 161 papers by the journal Emerging Infectious Diseases with 77 g-index and 7.42 of Impact factor. The United States of America placed first for publications and the journal Lancet for Impact factor. Between 100 and 855 citations crossed 142 papers and Virology and Infectious disease are the research areas of this topic. There are 115 subject areas covering hanta virus and more than 100 publications by 13 subjects.

## Research Methods

To direct this exploration in a reference and library way, electronic assets have been investigated regarding the matter of examination. The examination work started with the quest for the subject of Mucormycosis by the Web of Science web search tool, and as per the exceptionally different number distributed. In this examination, two principle terms were considered as free factors and related terms as reliant factors. This exploration has been cultivated quantitatively and dissects the information got from Biblioshiny programming. This is a strategy for considering, assessing, assessing and assessing quantitative logical writings utilizing numerical techniques and measurements. The reason for being crafted by bibliometrics considerations depends on four primary factors including creators, logical distributions, references and references. The

bibliometrics is the beginning of different spaces of quantitative estimation (Scientometrics, Informatics and Webometrics).

## Results

### Publications output by countries

The study found that the worldwide research publications in the area of Mucormycosis was commenced by 95 countries all throughout the world between 1923 and 2021 ( May), of which, During the study period, 22 countries published single papers constantly. Among 95 countries, the first ten countries contributed 76.4 percent of records and received 73,732 Global citation scores. The country of USA published the highest records of 33 percent followed by India10.9 percent, France 6.5 percent, Germany 5.6 percent and Spain 5.2 percent respectively. Citation based countries; the first four places by USA (38674), France (6807), Germany (5535) and India (5223) and 9 countries have not received even a single citation in this period of study.

### Prolific Authors

There are 17320 authors who published 4451 records with the number of collaborated authors representing 23552 of this study. Based on this data, documents per author are 0.257, authors per document are 3.89 and co-authors per document are 5.29. The first four authors published more than 50 records, the highest records of 98 by the author Kontoyiannis DP with 7004 citations, followed by Ibrahim AS (59 records) with 3143 citations, Walsh TJ (55 records) with 4432 citations and Chakrabarti A(51) respectively. 287 documents by single authored publications, 505 documents by two authored publications, 702 documents by three authored publications, 719 documents by four authored publications, 581 documents by five authored publications and 289 documents are more than 10 authored publications. 74 authors from various parts of the countries have published single article in 2019 in the journal of Lancet Infectious Disease (Volume.19;Issue.2), the title 'Global guideline for the diagnosis and management of mucormycosis: an initiative of the European Confederation of Medical Mycology in cooperation with the Mycoses Study Group Education and Research Consortium' with English language and the corresponding author Cornely, OA from Department of Internal Medicine, University Hospital Cologne, Germany.

### Highly cited Articles

The quality of the paper is measured based on citations and their Hirsch index. Among 4451 documents, 36 of them cited more than 200 times and 497 have not crossed citation. During this study period the highest citation 1328 received the article, 'Epidemiology and outcome of zygomycosis: A review of 929 reported cases' by the author Roden MM, Zaoutis TE, Buchanan WL et.al. from the journal of Clinical Infectious Diseases 41(5), 2005, followed by the title 'Zygomycetes in human disease' received 940 citations by the authors, Ribes JA, Vanover-Sams CL and Baker DJ, from Clinical Microbiology Reviews 13(2), 2000, 'Novel perspectives on mucormycosis: Pathophysiology, presentation, and management received 558 citation by Spellberg B, Edwards J and Ibrahim A from Clinical Microbiology Reviews 18(3), 2005 and 448 citations received the article, Epidemiology and clinical manifestations of Mucormycosis

by Petrikkos George, Skiada Anna, Lortholary Olivier et al. from Clinical Infectious Disease 54 (1), 2012.

**Journals contribution**

Researchers and scientists are preferred in journal articles for their research published. More than fifty percent of the publications are in articles (63 %), 1161 journals are contributed in the research publications of mucormycosis. The highest articles (204) published in the journal 'Mycoses' with 1333 authors, received 4875 cited references and the h-index has 24. This is the only journal published with more than 200 articles, the remaining are below 100 articles and 593 journals contributed single articles only. The journal, Clinical Infectious Diseases by 95 articles with 528 authors, followed by Medical Mycology has 88 articles with 646 authors; Mycopathologia has 80 articles with 483 authors respectively.

**Languages of Publications**

English as the predominant language for publications of research, researchers and scientists are mostly preferred in this language for their publications. The first article of this topic published in German language in 1923 by Lang FJ and Grubauer F. Total records published in eleven languages, 93.2 percent of the records published by the language of English appeared 22025 authors with cited references 106462. 121 records published by language of French with 754 authors followed by Spanish (90 records) and German (69 records). Among 11 languages, 7 of them are below 10 publications, single record by Hungarian and Russian languages.

**Publications output on Institutions**

There are 3797 institutions and their 8651 departments have published 4451 publications in 99 years on this topic on mucormycosis. Department of Infectious Control & Employee Health, The University of Texas MD Anderson Cancer Centre, USA has got the first place (96 records) for publications output, followed by Postgraduate Institute of Medical Education & Research, Chandigarh, India (86 records), University of California, Los Angeles (80 records) and Medical Centre, Duke University (60), Durham respectively.

**Table 1.The main findings of WoS data related to the keywords of Mucormycosis**

| **MAIN INFORMATION ABOUT DATA** | |
|---|---|
| Timespan | 1923:2021 |
| Sources (Journals, Books, etc) | 1161 |
| Documents | 4451 |
| Average years from publication | 13.6 |
| Average citations per documents | 16.58 |
| Average citations per year per doc | 1.31 |
| References | 41976 |
| **DOCUMENT TYPES** | |
| article | 2808 |
| article; book chapter | 25 |
| article; early access | 26 |

| | |
|---|---|
| article; proceedings paper | 110 |
| correction | 16 |
| discussion | 6 |
| editorial material | 221 |
| editorial material; early access | 3 |
| letter | 246 |
| letter; early access | 1 |
| meeting abstract | 392 |
| news item | 1 |
| note | 126 |
| proceedings paper | 11 |
| reprint | 1 |
| review | 450 |
| review; book chapter | 1 |
| review; early access | 7 |
| **DOCUMENT CONTENTS** | |
| Keywords Plus (ID) | 3033 |
| Author's Keywords (DE) | 3844 |
| **AUTHORS** | |
| Authors | 17320 |
| Author Appearances | 23552 |
| Authors of single-authored documents | 248 |
| Authors of multi-authored documents | 17072 |
| **AUTHORS COLLABORATION** | |
| Single-authored documents | 287 |
| Documents per Author | 0.257 |
| Authors per Document | 3.89 |
| Co-Authors per Documents | 5.29 |
| Collaboration Index | 4.10 |

Table 1 displays the main information start by Web of Science, including the number of entries, Timespan on 1923 to 14th May 2021, 1161 number of Sources (Journals, Books, etc), Documents (4451), Average years from publication (13.60%), Average citations per Documents (16.58%), Average citations per year per doc (1.31%), References (4976), authors, Authors Collaboration, Document Contents and the type Document of found on Mucormycosis.

In Figure 1 the production illustrations the contents of article, review, meeting abstract, letter, editorial material, note, article; proceedings paper, article; early access, article; book chapter, correction, proceedings paper, and various researches conducted in the years from 1923 to 14th May 2021. Fig. 1 shows the trend of the occurrence of the papers and we can observe that Mucormycosis have appeared mostly in 2019.

Figure 2 displays the growth rate of resources based on annual events. Graphs show the dynamics of various fields in the production of medicine, which use the keywords of Mucormycosis each year. Here there are 5 groups to be displayed and medical mycology materials related to the field of Mucormycosis in 2018 had the highest rates.

Time spent 1923 to 2021 graphical parameters word minimum frequencies 5, number of words per year Figure 2 displays the growth rate of resources based on annual events. Graphs show the dynamics of various fields in the production of medicine, which use the keywords of Mucormycosis each year. Here there are 5 groups to be displayed and medical mycology materials related to the field of Mucormycosis in 2018 had the highest rates.s 5 overall showing 90 entries. Subject patterns are additionally essential for this exploration, where the image Fig 3. Shows an outline of the advancement of the theme occasionally with the division each year. So it is understood what themes have

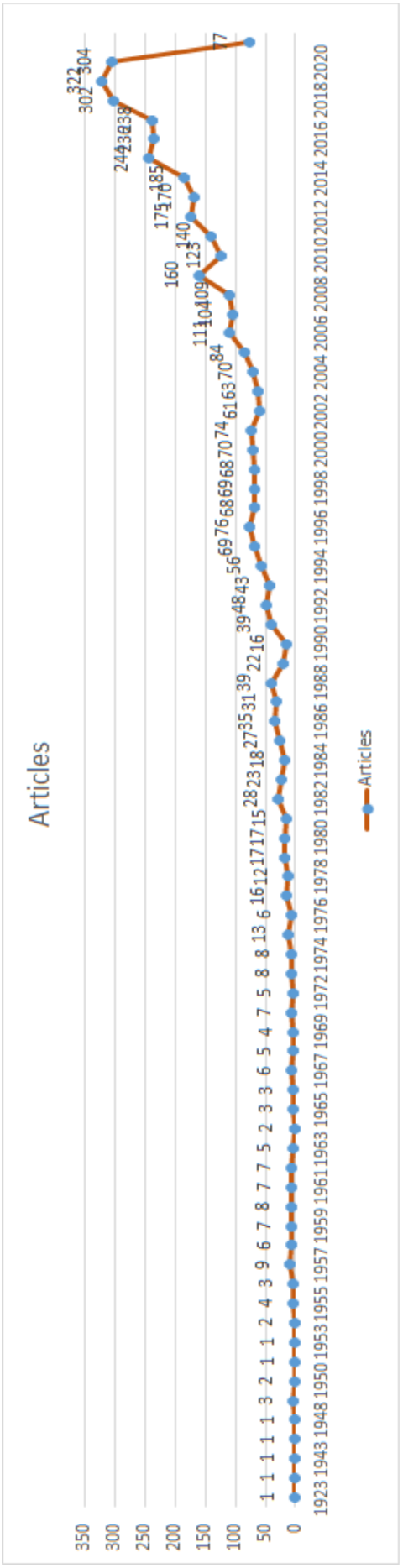
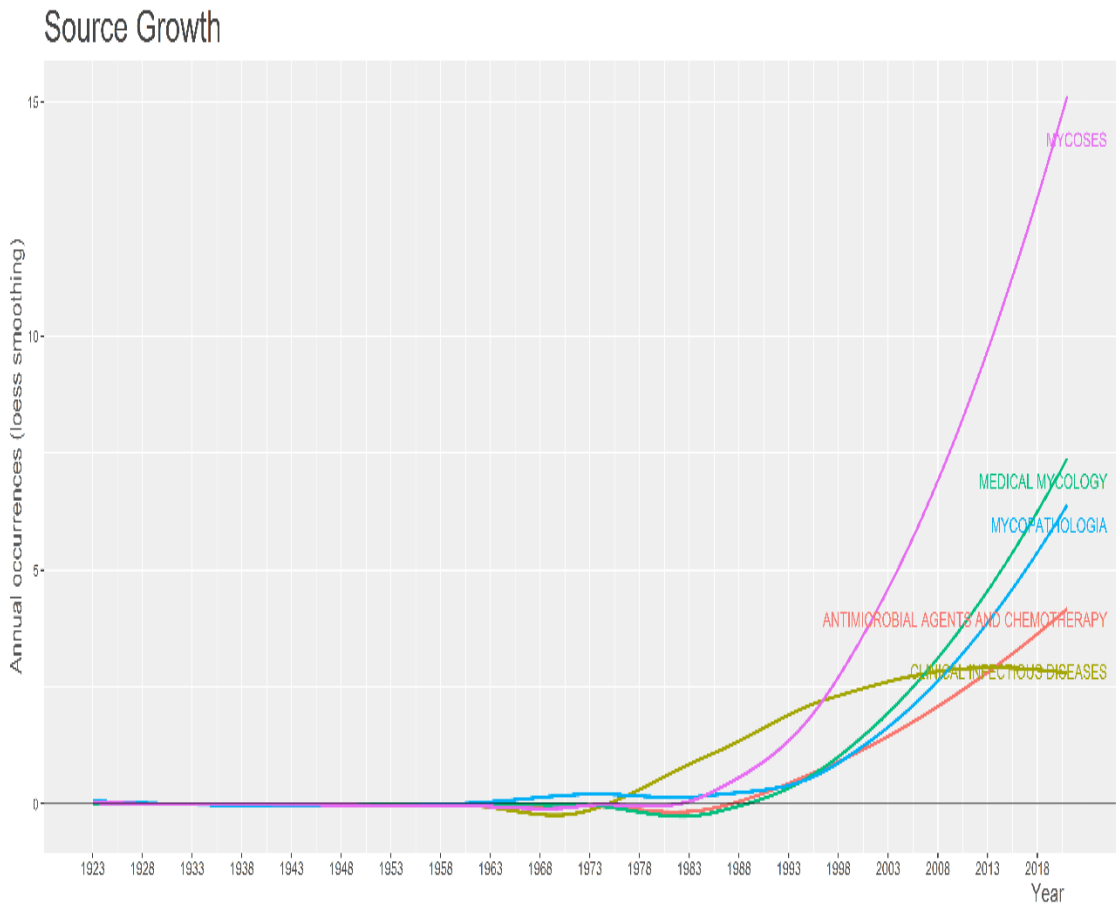



Figure 1 Generating annual science related to Mucormycosis

been utilized for quite a while and what points have been utilized as of late. The development of the subject is likewise changed in accordance with the recurrence of the word's appearance in research on the topic of Mucormycosis research. The higher the more the word is utilized and the more to the privilege the later the word is utilized. The advancement of the theme started to encounter a huge increment since 1991. Founded on the report of the data fig. 3, the topic has been used since 1991 understanding, especially those related to Mucormycosis research. Furthermore, in 2001 the topic of AbsidiaCorymbifera, Aids, Cattle, Heart Transplantation, Rhinocerebral Septicity began to develop. Even though it has been a long time, the number of the topics that have developed below 2007 is still lesser. Topics associated with the Hyperbaric Oxygen, Aplastic Anemia, Endophthalmitis.

Figure 2. Year wise Source Dynamics of Mucormycosis




Type 1 Diabetes Mellitus in Mucormycosis fields began to be carried out a lot in 1992-2007. Meanwhile, several topics associated to Rhizopus, Mucor, RhinocerebralMucormycosis, Treatment, Zygomycetes, Leukemia, Pulmonary Mucormycosis, Epidemiology, Diagnosis, Immunocompromised, Candidiasis, Voriconazole, Cutaneous Mucormycosis, Mycoses, Invasive Fungal Infections, And Invasive Aspergillosis began to be worked out in 2008 to 2021.

In this examination, an investigation of topical guides was likewise done dependent on thickness and centrality which were partitioned into 4 subject

quadrants as shown (figure 4) these outcomes were gotten from a self-loader calculation by assessing the titles, all things considered, to the exploration object with the expansion of significant catchphrases other than the creator's watchwords. With the goal that the outcomes can catch further varieties.

Figure 3. Trend Topics on keyword analysis in Mucormycosis

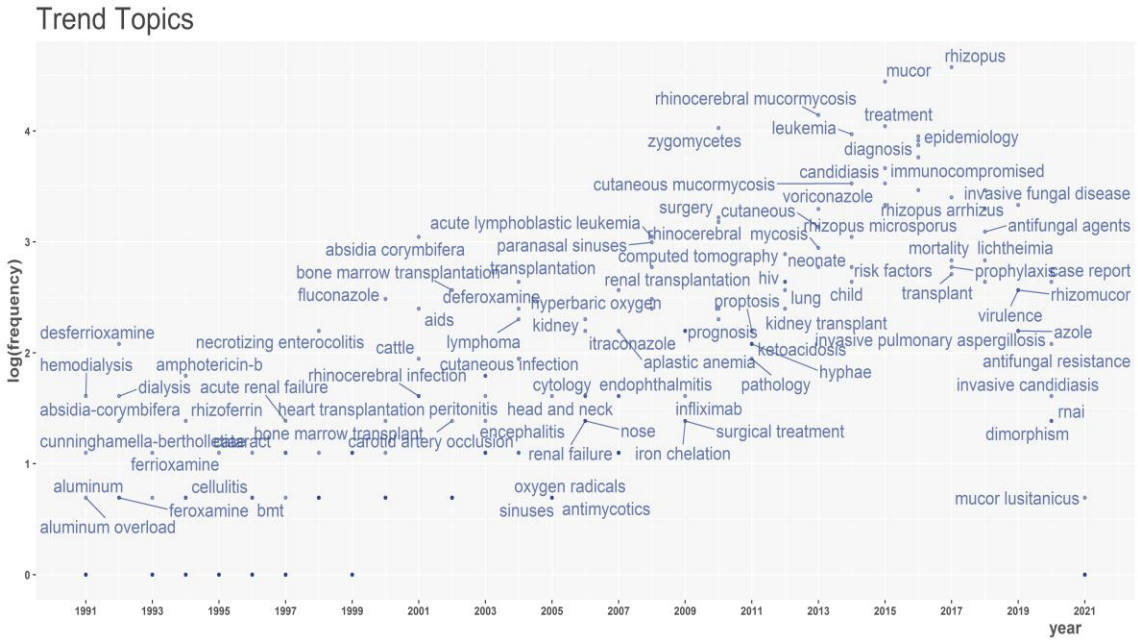
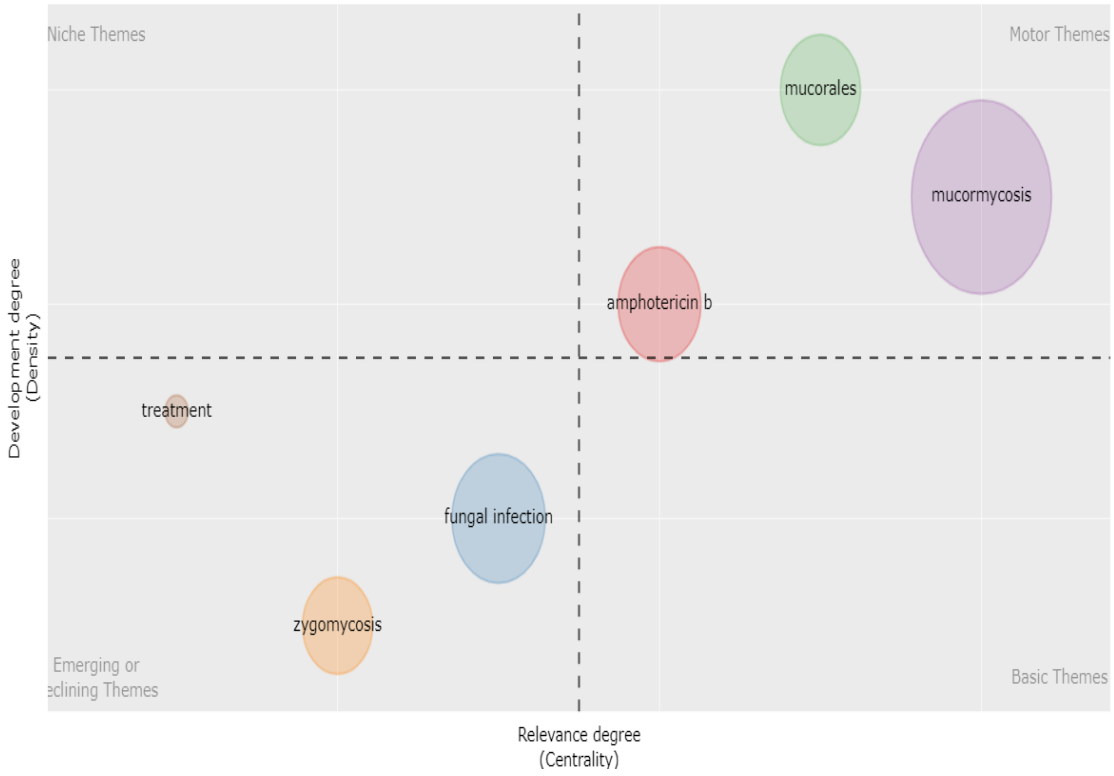


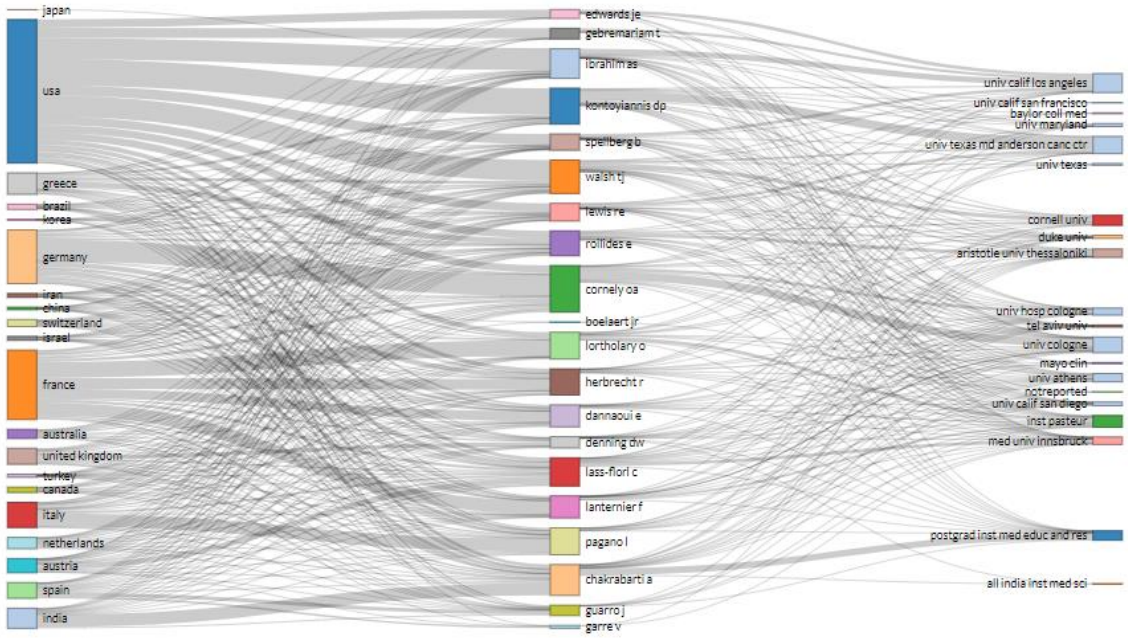

Figure 4. Thematic Map on Author Keyword of Mucormycosis



The upper right quadrant is an essential topic portrayed by high centrality yet low thickness. These subjects are critical to be remembered for the examination since they are general points that are ordinarily utilized, including the topics of Mucormycosis, Mucorales and Amphtotericin b investigation. Moreover, the lower left quadrant shows a particular and uncommon topic yet has a typical turn of events, which is shown by high thickness but low centrality. The topics in this quadrant incorporate Fungal Infection, Zygomycosis and Treatment. Finally, the upper left and lower right quadrant is a driving topic portrayed by high thickness and centrality, so it should be created and it is essential to be concentrated in additional examination.

Three fields plot authors, countries affiliations of mucormycosisFigure 5 presents the diagram for research in mucormycosis, focusing on relatives between the foremost countries, authors and affiliation. The analysis confirmed in which authors the countries of mucormycosis publications had published maximum frequently and which study topics of the mucormycosis concept they had explored. The research topics were silent here as the authors. The analysis of the top authors, affiliation, and countries indicated that there were three authors (i.e.,Cornely O3, Kontoyiannis DP and Chakrabarti A) and five affiliation (i.e., The University of California, Los Angeles (UCLA), University of Texas md Anderson Cancer Center, and University of Cologne) having strong relations with the mucormycosis main research countries (‘USA, France, and Germany in particular).

Figure 5. Relations between Countries (left), authors (middle), and Affiliations (right) for research in Mucormycosis




In addition, Figure 6 shows the relations between the main keywords, countries, and sources. This figure demonstrated the construction of top sources of publications in developing the information in the main topics in mucormycosis. The topics were represented by the keywords, and countries’ significance was signified by the number of relevant relationships. The analysis showed that the countries of publications based on

their contribution to the study of mucormycosis main countries were USA, India, Sustainability, France and Germany.

Figure 6. Relations between keywords (left), countries (middle), and sources (right) for research in mucormycosis.

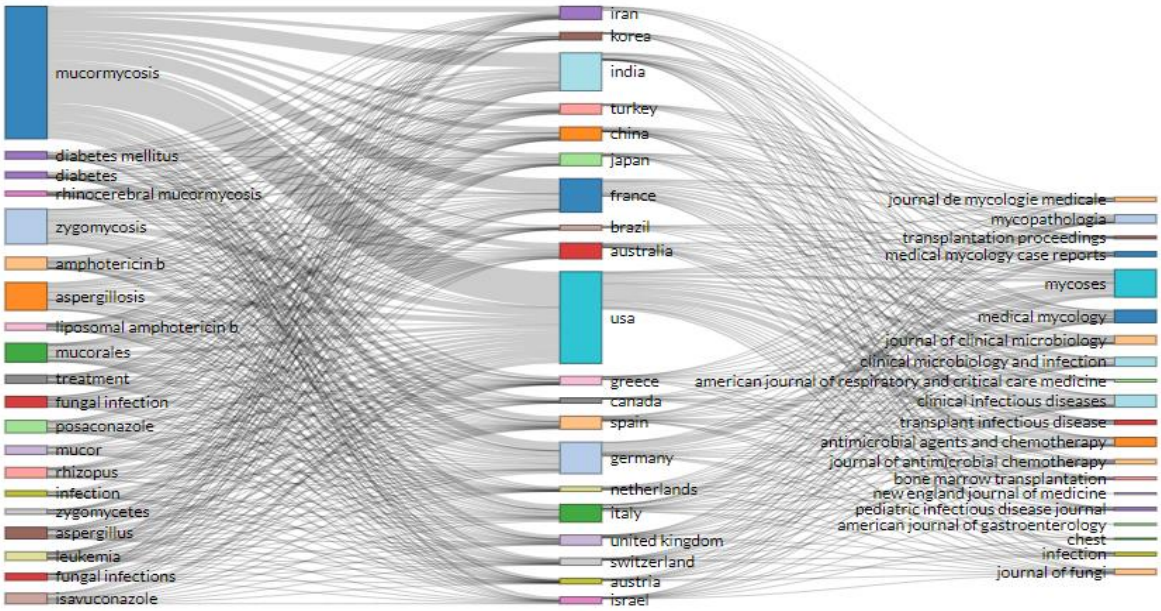
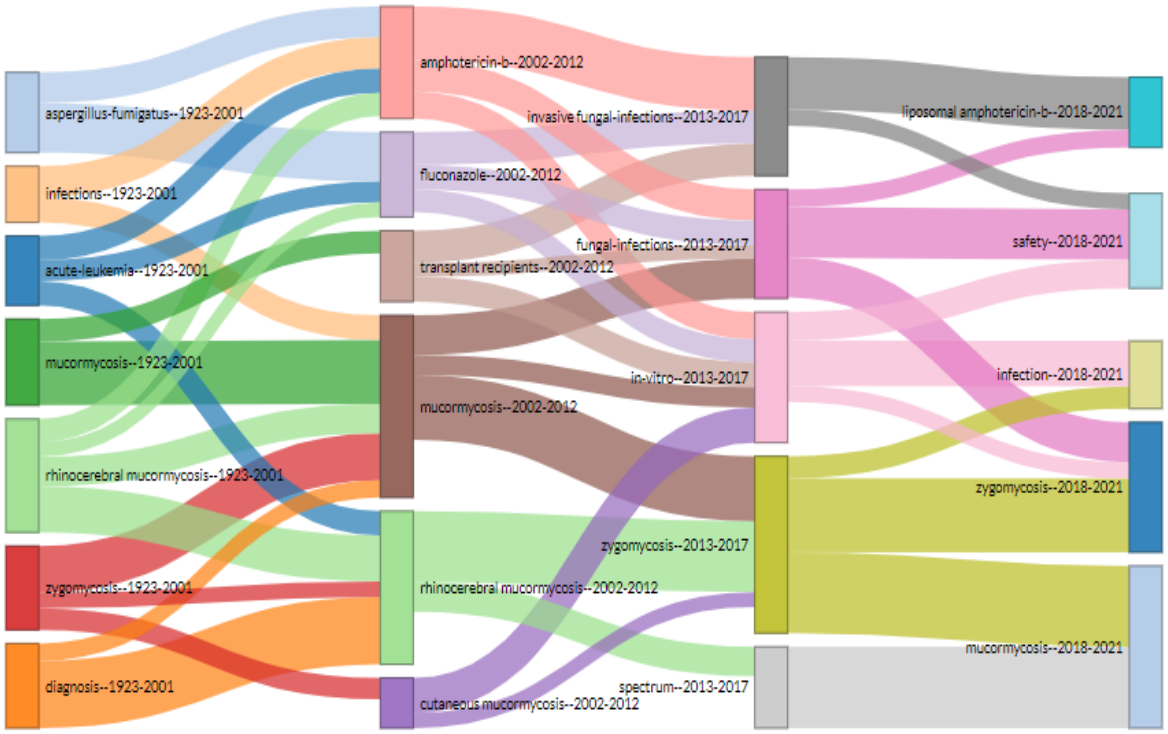
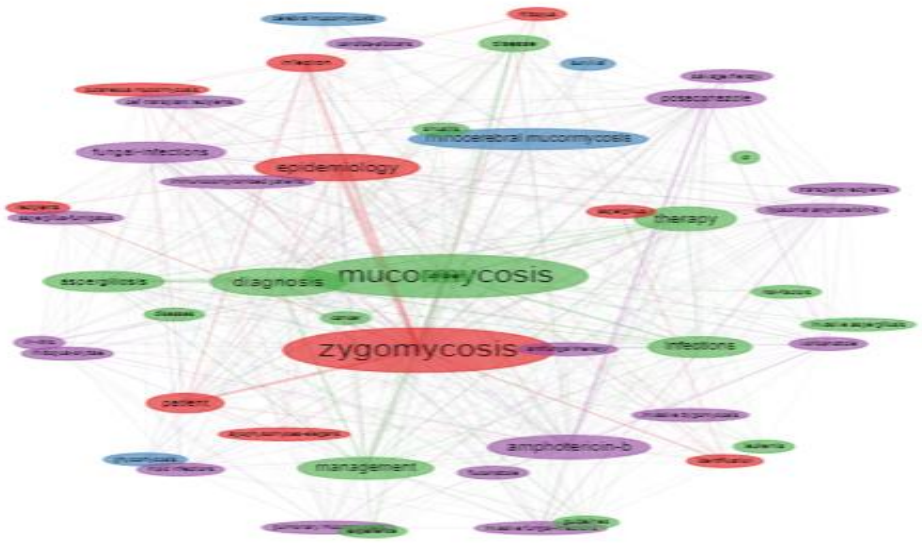



Figure 7. Thematic evolution of Keywords Plus in Mucormycosis



The thematic evolution of keywords during the last four decades showed a clear shift in scientific fields. It is parameters field author's keywords number of keywords 250, minimum cluster frequency (per thousand documents) 5, weight index weighted by word-occurrences minimum weight index 0.1. The emergence of broad and core themes is captured using the Thematic Evolution (Figure 7). A closer look at the inter-linkages among the themes separated by four-time spans, namely the period from 1923 to 2001, 2002–2012, 2013-2017 and 2018–2021 underscores the thematic evolution. Seven foremost themes in the first period, namely acute-leukemia, aspergillus-fumigatus, infections, mucormycosis, rhinocerebralmucormycosis, zygomycosis, and diagnosis, converge into a major theme mucormycosis and rhinocerebralmucormycosis. The six themes in the second period which contains amphotericin-b, fluconazole, transplant recipients, mucormycosis, rhinocerebralmucormycosis and cutaneous mucormycosis. While the five themes in the third period which contain invasive fungal-infections, fungal-infections, in-vitro, zygomycosis and spectrum merged into the single theme zygomycosis. This recognises the growing importance and relevance of zygomycosis and in-vitro. A major theme "zygomycosis" in the second time span delineates its close association with "zygomycosis" and "mucormycosis" implying its pertinence with interventions influencing zygomycosis.

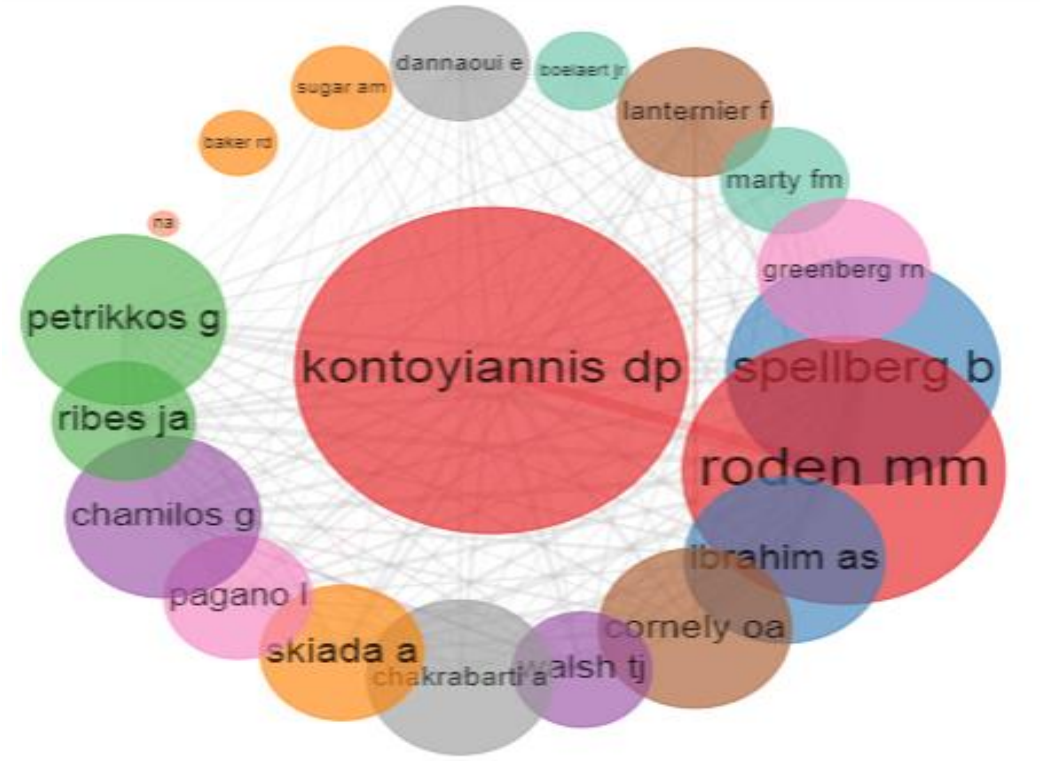
Figure 8. Keywords plus Co-occurrence Network onmucormycosis




To picture the research hotspots in mucormycosis scientific field, the co-occurrence of keywords Plus was analyzed. The keyword plus co-occurrence edge was set to six, and 3033 keywords out of 4451 were classified as visualization items. The keyword plus co-occurrence network is offered in Figure 8. The size of the spheres associated with the number of occurrences of the signified keywords plus. The larger the sphere, the more the keyword plus had been co-selected in mucormycosis. The topic comparison and its qualified strength were established by the basics of individual pairs. Not the same colors of the spheres were assigned to separate keyword plus clusters. The network in Figure 8

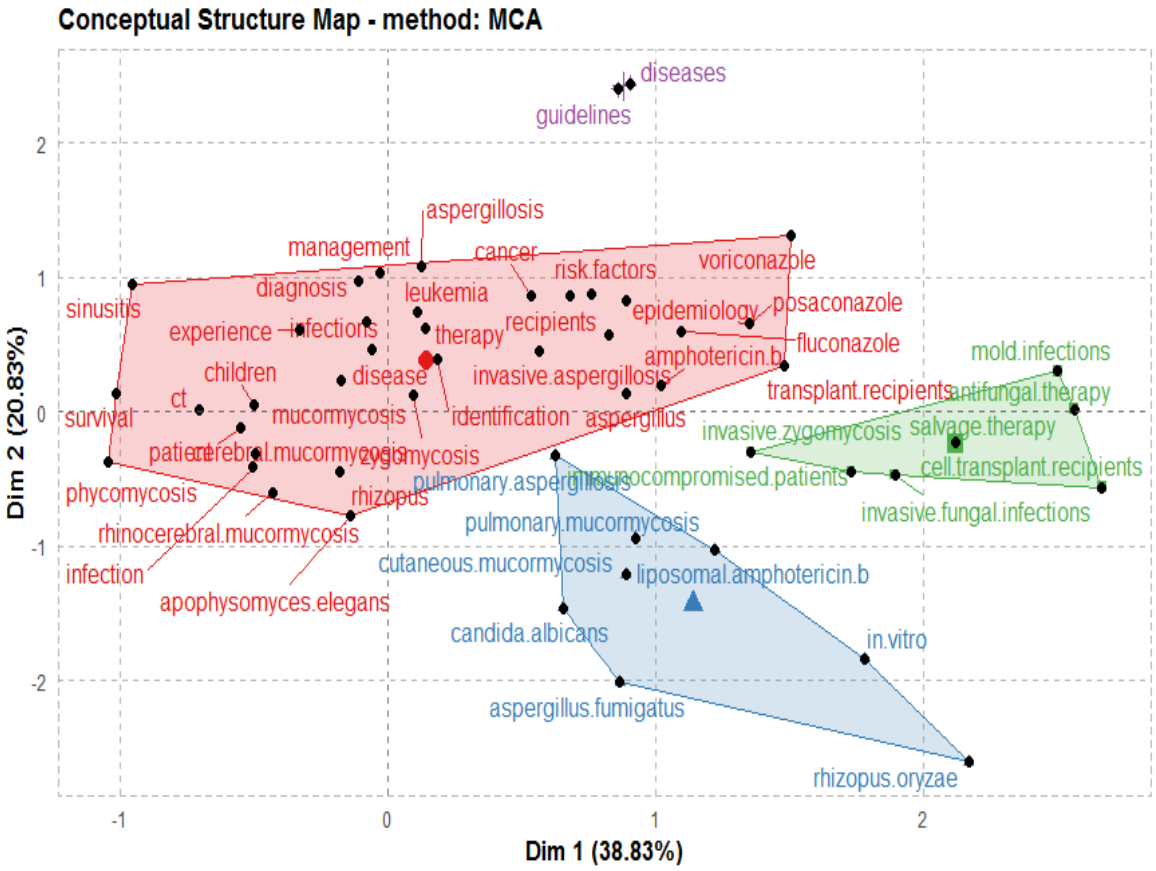
shows four separate clusters, expressive individual subfields of the study areas in the mucormycosis. The links between specific keywords plus showed the number of papers in which the keyword plus co-occurred. The main topics in the mucormycosis with the maximum total link strength were: ‘mucormycosis’,‘zygomycosis’, ‘amphotericin-b ‘, and ‘rhinocerebral’,’mucormycosis’. Fifty two subfields (clusters of keywords plus) were identified in mucormycosis scientific field, and the four main subfields were as follows:#red cluster grouping organised such keywords as ‘mucormycosis’, ‘epidemiology’, ‘infections’, ‘patient’, ‘cutaneous mucormycosis’, 'recipients', 'identification', 'rhizopus', 'apophysomyces-elegans', and 'aspergillus'. green cluster grouping composed such keywords as 'mucormycosis','diagnosis','infections','aspergillosis',' therapy','management','disease','experience','guidelines','invasive aspergillosis', 'leukemia', 'cancer', 'diseases', 'risk-factors', 'sinusitis' ,'ct', and 'children'. Purple color cluster grouping collected such keywords as 'amphotericin-b', 'fungal-infections', 'posaconazole', 'liposomal amphotericin-b', 'invasive fungal-infections', 'voriconazole', 'in-vitro', 'rhizopus-oryzae', 'pulmonary mucormycosis', 'transplant recipients', 'mold infections', 'cell transplant recipients', 'invasive zygomycosis', 'immunocompromised patients', 'salvage therapy', 'aspergillus-fumigatus', 'candida-albicans', 'antifungal therapy', and 'fluconazole'. Blue color cluster grouping collected such keywords as 'rhinocerebralmucormycosis', 'cerebral mucormycosis', 'phycomycosis', and 'survival'. The found results confirmed a considerable variety of the co-occurrence of keyword plus in separate publications in the mucormycosis. This proved the multi-layered and multidimensional personality of this specific systematic field.

Figure 9. Authors Co-citation Network on Mucormycosis



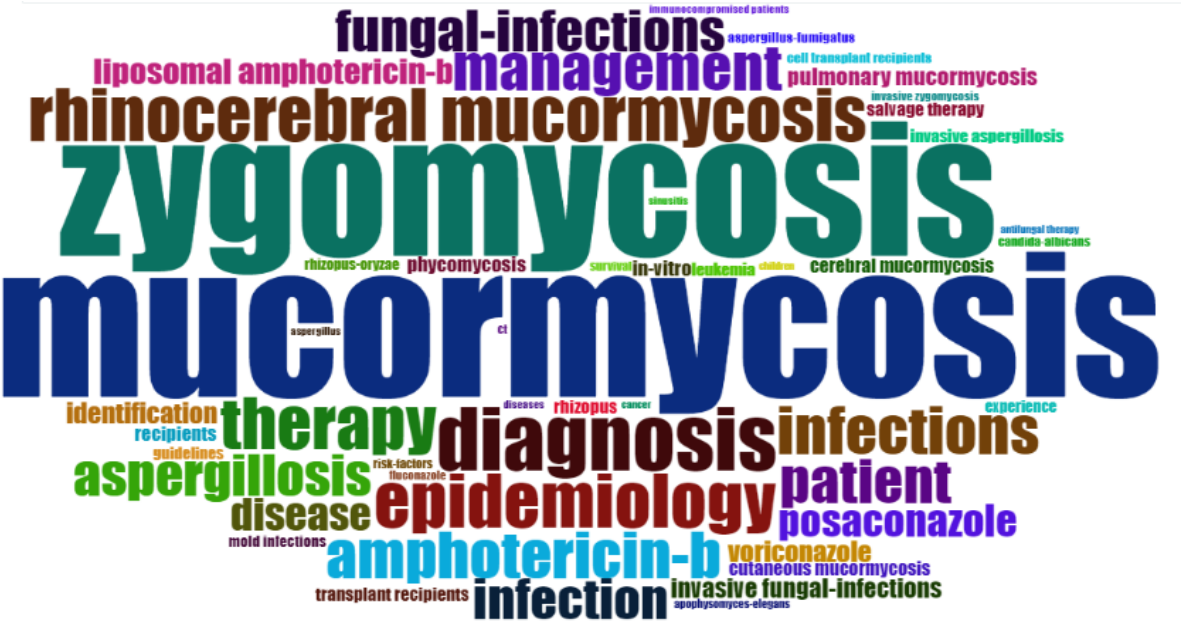

Intellectual structure displays the interaction among themes, topics using co-citationnetwork or authors' analysis. The situation is the only scheme which uses the content of study documents. Accordingly, the unit of study is an idea or usually utilized terms, or a subject discovered together in the organization. Drawn for authors unit of analysis, with default options–star layout and normalisation by association using InfoMap clustering algorithm with 50 nodes–gave the author co-citationnetwork as shown in Figure 9. "Author" are the words extracted by a computer algorithm based on commonly found words in the paper and in the reference list of documents. They are preferred as they capturethe document's content with more wisdom and multiplicity. As seen in Figure 9, ten clusters indicated in Red, Blue, Green, purple, Sandal and brown emerged from the data. The colours represent different clusters; distance implies the relatedness; vertex is represented by words and the size of the node is proportionate to its co-citation. The red cluster showed strong co-citation for three core sources (Kontoyiannis DP, and Roden MM). The other cluster consisted of relatively weak co-citation authors, e.g. Skiada A, Sugar AM, and Baker RD co-citation network on mucormycosis.

Figure 10. Factorial Analysis Keywords Plus by MCA **on** mucormycosis




Conceptual structure shows the interaction between themes, topics and trends using co-occurrence network or co-word analysis. It is the only method which uses the content of research papers. Accordingly, the unit of study is an idea or usually utilized terms, or a subject discovered together in the organization. Bibliometrix bundle determines this calculated construction of the exploration field by leading various correspondence investigations (MCA). Mathematical and graphical investigation of multivariate ostensible information should be possible utilizing MCA. Drawn for keyword plus unit of analysis, with default options–automatic layout and normalisation by association using Louvain's clustering algorithm with 50 nodes–gave the keyword co-occurrence network as shown in Figure 10. "Keyword Plus" are the words extracted by a computer algorithm based on commonly found words in the titles and in the reference list of documents. They are preferred as they capture document's content with more profundity and diversity. As seen in Figure 10, three clusters indicated in red, blue and green emerged from the data. The colours represent different clusters; distance implies the relatedness; vertex is represented by words and the size of the node is proportional to its occurrence. Green cluster is dominated by financial literacy; the red cluster highlights behaviour and education; While the blue cluster integrates household financial decisions like consumption, savings, insurance and retirement.

Figure 11. Wordcloud (Keywords Plus) on mucormycosis




The Word Cloud is created through 'Biblioshiny App' of 'R version 4.0.0' software. In graphical parameters, keywords plus were selected. The main advantage of selecting keywords plus is that, it provides insight into main topics and research trends on mucormycosis. The number of keywords plus was limited to 50. In shape of figure, circle was certain. Random dark colour was designated as the text colour. The ellipticity, and padding values were 0.65 and 1 respectively. Top 10 frequently occurred keywords plus with their frequencies is shown in Figure 11 shows the visualization of top 50 frequently occurred keywords plus highly visible mucormycosis, than next level visible zygomycosis, following words diagnosis, epidemiology, therapy, rhinocerebral mucormycosis, amphotericin-b and other word size very small.

## Conclusion

Toward the best of our insight, our investigation is the major scientometric and bibliometric concentrate in mucormycosis. Organization contemplates showed that multicenter considers were only sometimes in this field. As uncovered in this investigation driving nations with the most elevated number of distributions were created and extra inquiries ought to be led from countries such as USA, France, Germany and Spain Citation based countries USA, France, Germany and India. The highest articles (204) published in the journal 'Mycoses' with 1333 authors, received 4875 cited references and the h-index has 24 in mucormycosis. The first four authors published more than 50 records, the highest records of 98 by the author Kontoyiannis DP with 7004 citations. The quality of the paper is measured based on citations and their Hirsch index. Among 4451 documents, 36 of them cited more than 200 times and 497 have not crossed citation. The highest articles (204) published in the journal 'Mycoses' with 1333 authors, received 4875 cited references and the h-index has 24. Highly published papers were published by The University of Texas MD Anderson Cancer Centre.

## References


1. Amsaveni, N., & Krishnan, H. C. (2018). A scientometric analysis of environmental management research output during 1989 to 2014. Library Philosophy and Practice, 1.
2. Amsaveni, N., & Manikandan, M. (2014). Management Information System Research output: A Scientometric Study. Journal of Current Trends in Library and Information Science: International Refereed Journal. Vol, (1), 51-55.
3. Amsaveni, N., & Ramesh, K. (2016). Mapping of research productivity in forensic science: A scientometric analysis. Journal of Advances in Library and Information Science, 5(4), 372-378.
4. Amsaveni, N., & Vasanthi, R. (2013). Mapping of Green Biotechnology Research a Scientometric Analysis.
5. Amsaveni, N;Vasanthi,R and Sivasekaran, K (2013). Open Access of E-Journals in Technology and Engineering to DOAJ: A scientometric study, Global Research Analysis, 2(3), 87-89.
6. Ashok kumar, P.; Santosh A Navalur; Sivasekaran, K (2013). A scientometric study of Biodiversity Research in India: A special Reference to Authors Productivity, International Journal of Scientific Research, 2(3), 58-60.
7. Ashokumar,P ; Sivasekaran, K (2017), Mapping Of Global Level Authorship Trends In Clinical Neurology Using Scientometric Analysis, International Journal of Library Science and Information Management ( IJLSIM),3(2), 68-73.
8. Ashokumar,P; Sivasekaran, K (2015). User's Attitude towards e-resources by undergraduate students of SakthiMariamman Engineering College, Chennai: A Study, International Journal of Library Science and Information Management (IJLSIM), 1(.2), 26-31.
9. Ashokumar,P; Sivasekaran, K (2017), A Scientometric study on Neutrino research: continental research analysis, International Journal of Library Science and Information Management ( IJLSIM),3(4), 31-38.
10. Balamurugan, CPS; Srinivasaragavan, S and Sivasekaran, K (2015) School Education research in India : A scientometric Analysis, Indian Academic Library Association, 3(2), 28-34
11. Chithiraivel, S; Jeyshankar, R, and Sivasekaran, K (2020). Authorship Patterns in Eosinophilia Research Literature: A Scientometric Analysis, Library Philosophy and Practice (e-journal). 4162. https://digitalcommons.unl.edu/libphilprac/4162
12. Chithiraivel,S; Sivasekaran, K and Jeyshankar Ramalinagam (2020), Global Research output on Eosinophilia Literature: A Scientometric Analysis (2020). Library Philosophy and Practice (e-journal). 4040. https://digitalcommons.unl.edu/libphilprac/4040.
13. Dallalzadeh, Liane O., et al (2021). Secondary infection with rhino-orbital cerebral mucormycosis associated with COVID-19." Orbit 1-4.
14. Janik, A., Ryszko, A., &Szafraniec, M. (2020). Scientific landscape of smart and sustainable cities literature: A bibliometric analysis. Sustainability, 12(3), 779.
15. Kamatch, S., Stanleay, P., Subramanian, C., Kumar, A., & Thirumagal Arumugam, D. (2019). Electric Car: A Research Impact BY Means OF Scientometric Analysis.

16. Kancharu, Feroze Khan, et al (2020). Mucormycosis of neck a rare presentation." Indian Journal of Otolaryngology and Head & Neck Surgery, 1-5.
17. Kumar, P. Ashok., Manoranjitham, R and Sivasekaran, K (2020). Mapping of Microbial Technology Research Output at the Global Level: A Scientometric Study Library Philosophy and Practice (ejournal). 4550. https://digitalcommons.unl.edu/libphilprac/4550.
18. Laksham, S., Surulinathi, M., Balasubramani, R., & Srinivasaragavan, S. (2020). Mapping the research output on Coronavirus: A Scientometric Study.
19. Liu, H., Peng, K., Li, W., & Cao, Y. (2019). Investigation on the trends and characteristics of articles on submerged macrophytes: perception from bibliometrics between 1991 and 2018. Journal of Freshwater Ecology, 34(1), 703-713.
20. Mohanty, D., M. Dhar, and S. Dwivedi (2010). Mucormycosis. Tropical doctor 40(2), 127-128.
21. Patil, S. B. (2020). Global Library & Information Science Research seen through Prism of Biblioshiny. Stud. Indian Place Names, 40, 158-170.
22. Petrikkos, George, et al (2012). Epidemiology and clinical manifestations of mucormycosis." Clinical Infectious Diseases 54(1), S23-S34.
23. Poornima, A., Surulinathi, M., Amsaveni, N., & Vijayaragavan, M. (2012). Mapping the Indian research productivity of food science and technology: A scientometric analysis.
24. Prakash, Hariprasath, and Arunaloke Chakrabarti (2019). Global epidemiology of mucormycosis. Journal of Fungi 5(1), 26.
25. Ramasamy, R U Sivasekaran, K and Navasakathi, C (2013). Scientometric Analysis of Thorium Research in India: A Case study, Global Journal for Research Analysis, 2 (4), 80-82
26. Rusydiana, A. S., Sanrego, Y. D., &Pratomo, W. A. (2021). Mathematical modeling on Islamic economics and finance: A scientometric. Library Philosophy and Practice (e-journal), 4834.
27. S. Chithiraivel; K. Sivasekaran; and Ramalinagam Jeyshankar (2020). Global Research output on Eosinophilia Literature: A Scientometric Analysis. Library Philosophy and Practice (e-journal), 4040. https://digitalcommons.unl.edu/libphilprac/4040.
28. Sen, M., Honavar, S. G., Sharma, N., &Sachdev, M. S. (2021). COVID-19 and Eye: A Review of Ophthalmic Manifestations of COVID-19. Indian Journal of Ophthalmology, 69(3), 488.
29. Sivankalai S (2020) Growth of Herpes Research in the 21st Century: A Scientometric Analysis, Library Philosophy and Practice (e-journal) 5-15,1-16.
30. Sivankalai S. and NazeerBadhusha K, (2020).Bibliometric study on COVID 19 Outbreak. International Journal of Library and Information Studies, 10(2), 1-9.
31. Sivankalai, S (2016). Authorship Pattern and Collaborative Research in the Field of Quality Management, International Journal of Innovative Research in Management Studies (IJIRMS) 1(10), 79-85.
32. Sivankalai, S and KibromYemane, (2017).Bibliometric analysis of research output in quality management at African continent from 1990-2016, International Journal of Innovative Research in Management Studies (IJIRMS) 2(3), 40-48.
33. Sivankalai, S., Virumandi, A., Balamurugan, B., and Sharmila, M (2021) Scientometric Analysis of the Research on the Abortion: 2015-2019, Turkish Journal of Computer and Mathematics Education 12 (4), 115-124

34. Sivankalai, S., Virumandi, A., Kaladevi, P., and Sharmila, M. (2021). Plagiarism:A Scientometric Review of the World Literature between 2000 and 2019, Annals of the Romanian Society for Cell Biology25 (4), 10380-10391
35. Sivankalai, S.,Sivasekaran, K., Virumandi, A., and Sharmila, M. (2021). Measuring the Honey Bee Research Output: Scientometrics Analysis from 2004 to 2019, International Journal of Modern Agriculture, 10(2), 2199-2209
36. Sivankalai, S; Virumandi, A; Sivasekaran, K; BalaSankar, B; Balamurugan, B; Sharmila, M and Kaladevi, P (2021). Scientometric Analysis and Visualization of Astrovirus based on R-packages, Library Philosophy and Practice (e-journal). 5361. https://digitalcommons.unl.edu/libphilprac/5361.
37. Sivasekaran, K (2015). India's Contribution on Renewable energy Research Output: A Scientometric Study, Journal of Advances in Library and Information Sceince (JALIS), 4(4), 311-316.
38. Sivasekaran, K (2016). Tobacco Literature output in India: A Scientometric Analysis, International Journal of Library Sceince and Information Management ( IJLSIM), 2(4),52-61.
39. Sivasekaran, K (2015). Literature output on Rice in India: A scientometric study, Journal of Advances in Library and Information Science, 4(1), 40-47.
40. Sivasekaran, K and Srinivasaragavan, S (2014). Journal of Astrophysics and Astronomy : A Bibliometric study, e-Library Science Research Journal, 2(6)
41. Sivasekaran, K and Srinivasaragavan,S and Ashokkumar, P (2013). Productivity of Educational Research in India: A Bibliometric Study, IJISS, 7(2),42-48.
42. Sivasekaran, K. (2021). Curcuma Longa (Medicinal Plant) Research: A Scientometric Assessment of Global Publications Output with Reference to Web of Science. Turkish Journal of Computer and Mathematics Education (TURCOMAT), 12(5), 1477-1496.
43. Sivasekaran, K., Stanleayb,P., Ashok Kumar,P., Sivankalai,S., Sivasamy, K.(2021). Curcuma Longa(Medicinal Plant) Research: A Scientometric Assessment of Global Publications Output with Reference to Web of Science, Turkish Journal of Computer and Mathematics Education 12 (5), 1477-1496
44. Sivasekaran, K; Prabakar,S; Chithiraivel, S; Ashok Kumar, P and Thirumagal.A, (2019). Electric Car: A Research impact by means of scientometric analysis, Library Philosophy and Practice (e-journal), 3660. https://digitalcommons.unl.edu/libphilprac/3660.
45. Sivasekaran, K; Srinivasaragavan,S (2013). Mapping of Research Publications on Himalayas : A Scientometrics Exploration, International Journal of Scientific Research, 2(3), 58-60
46. Sivasekaran, K; Stanleay, Prabakar and Ashok Kumar, P (2020). Mapping the Study and Awareness on Early Death Research: A scientometric Analysis, Library Philosophy and Practice (e-journal). 4368. https://digitalcommons.unl.edu/libphilprac/4368.
47. Sivasekaran, K; Vasanthi, R (2016).Scientometric Aspect of Uranium Research Output on BRICS Nations, Indian Academic Library Association, Vol. 4(2), 31-38.
48. Surulinathi, M., Balasubramani, R., & Amsaveni, N. (2020). COVID-19 research output in 2020: The Global Perspective using Scientometric Study. Library Philosophy and Practice, 2020.

49. Surulinathi, M., Balasubramani, R., & Kalisdha, A. (2013). Continent wise Analysis of Green Computing Research: A Scientometric Study. Journal of Advances in Library and Information Science, 2(1), 39-44.
50. Surulinathi, M., M. Karthik, and R. Balasubramani (2020). Research output on Hantavirus: A Scientometric Study." Journal of Shanghai Jiaotong University 16(7), 322-336.
51. Tayebi, S., Manesh, S., Khalili, M., &Sadi-Nezhad, S. (2019). The role of information systems in communication through social media. International Journal of Data and Network Science, 3(3), 245-268.
52. Vijayakumar M., Sivankalai S., Michael Joseph Stalin P., Kumaresan G., Selvakumar P., Manikandan V.(2021). A scientometric Analysis on Development of Nanofluids for Heat Transfer and Fluid Flow Applications. Solid State Technology, 64(2), 3667-3684.
53. Wadhera, Raman, and AarushiVashist (2020). Rare Presentation of Nasal Mucormycosis, Indian Journal of Otolaryngology and Head & Neck Surgery 1-3.