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Information Management as Nexus to Promote Indigenous Medicine Use to Enhance Public Healthcare Delivery: A Bibliometric Analysis

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Abstract

The paper uses a bibliometric analysis explore citations trend of ethnomedicine and information management, and text mining algorithm of a total number of 8, 333 publications ($n = 8,333$) were conducted based on the title, abstract and keywords to find co-occurrence of key terms in indigenous medicine and information management. The objectives of this study were to first, analyze the authorship, outputs and citation trend and to find out if researchers have been able to establish a nexus between indigenous herbal use and the role of information management in promoting such use. Second, to establish if there is an already link in the information management research through collaboration as a nexus to promoting indigenous use of herbal medicine to enhance public healthcare delivery systems in the continent. A computation synthesis of the data was performed using R programming statistical analysis and VOS bibliometric software to visualize the analyzed data. Based on the R programming output, the total author sample size were 35,970 ($n = 35,970$), and their total publications outputs were $n = 8,333$ and the total outputs parameters was as follows: Min = 5.00 Max = 71.00, $\mu = 10.59$. The average citation per items was 4.74 (ACP = 4.74) h -index=60, sum of times cited (STC = 39,572), citing articles (CA = 32,749) without self-citations ($n = 36,042$) and it's citing articles (CA= 30,777). The findings suggested that researchers were yet to establish the nexus between information management and its impact in promoting indigenous use of natural remedies within the public healthcare delivery to promote its efficacies.

Keywords: Biodiversity, Ethnomedicine, Herbs, Indigenous Knowledge Systems, Information Management, Information Packaging and Dissemination

Introduction

The study conducted a bibliometric analysis of publications and research outputs to find if there is an established connection between information management, Library and Information Science (LIS) and ethnomedicine. Because, several studies have suggested that indigenous plants in Africa can be used to treat or cure many infections and diseases (Nwidu, Elmorsy & Carter, 2016; Williams & Whiting, 2016). There is sufficient literature that documents indigenous plants as efficacious against infants respiratory infection (Etim, Obande, Aleruchi, Bassey, 2016) or as an anti-fungi or for preventing bacterial (Ogbole, Ayeni, Ajaiyeoba, 2018), and other benefits may include using indigenous plants as a means to treat illnesses (Attah, Hellinger, Sonibare, Moody,

Arrowsmith, Wray & Gruber, 2016). For example, Nigeria is still ravaged by malaria due to the presence of mosquitoes. Hence, several medicinal plants have been discovered as natural remedies to cure or prevent malaria. Such plants being used as indigenous antimalarial medicines were *Alstonia boonei*, and *Azadirachta indica* amongst other indigenous plants (Odugbemi, Akinsulire, Aibinu, Fabeku, 2007; Asnake, Teklehaymanot, Hymete, Erko & Giday, 2016). However, despite the use of these rich natural biodiversities in the continent, most of the benefits, uses, and potencies are not known, and most people still rely on synthetic drugs for therapeutic purpose. One of the significant gaps causing this divide was the lack of proper and professional information packaging and dissemination to promote the importance of indigenous healthcare management systems with potent natural herbs. A study suggested that many vendors selling herbs in public could not provide useful information about toxicity, and dosage administration (Ajibade, 2018). However, the use of these natural bio-resources could be promoted to the public if information professionals could be engaged to help in the classification and knowledge organization of potent natural herbs in Africa. They might be able to collaborate with scholars in other biodiversity and ethnomedicine area to come up with useful information management and dissemination strategies to rapidly promote the use of abundant natural herbs on the continent. Therefore, this study uses bibliometric analysis to explore the citations and publications trends of published articles on ethnomedicine (cf. methodology section for search strategies). Due to the vast amount of data collected, we employed R programming computation tools with the capability to explore and analyze big data to summarize the critical metrics of the output.

Objectives

The study objectives were to;

1. Examine the co-citation trend by authors and institutions,
2. Examine if there is an established nexus between ethno medicine publications and information management,
3. Identify the prolific the most cited outputs and their collaboration network,
4. Examine the summarize metric/indicators of the top prominent outputs,
5. Assess the relevance score and weight of outputs to examine the research trends in these subject areas,

Methodology

We performed advanced search and used these combined search strings in the Web of Science database to retrieve the data used based on these following search queries/strings. TS=("ethnomedicine use") OR TS= ("indigenous plant") OR TS=("indigenous medical practice") OR TS= ("antimalarial ethnomedicine") OR TS= ("information management") OR TS= ("information processing") AND CU=(South Africa) OR CU=(Nigeria) Timespan: 2014-2018. Indexes: SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI. (TS=("ethnomedicine use") OR TS= ("indigenous plant") OR TS=("indigenous medical practice") OR TS= ("antimalarial ethnomedicine") OR TS= ("information management") AND CU=(South Africa) OR CU=(Nigeria)) AND LANGUAGE: (English) AND DOCUMENT TYPES: (Article) Refined by: Organizations-Enhanced: (University Of Ibadan OR University Of Cape

Town OR University of Nigeria OR Obafemi Awolowo University OR Ahmadu Bello University OR University of Lagos OR University Of Ilorin OR Stellenbosch University OR University of Benin OR Nigerian Institute of Medical Research OR International Institute Of Tropical Agriculture OR University Of Calabar OR University Of Pretoria OR University College Hospital Ibadan OR North West University South Africa OR Covenant University OR Ekiti State University OR University of Johannesburg OR Tshwane University Of Technology OR University College Ibadan Hospital OR University of Fort Hare OR University Of KwaZulu Natal OR University of South Africa) AND PUBLICATION YEARS: (2018 OR 2017 OR 2016 OR 2015 OR 2014) AND COUNTRIES/REGIONS: (Nigeria OR South Africa) AND [excluding] RESEARCH AREAS: (Engineering OR Science Technology Other Topics OR Chemistry OR Materials Science OR Geology OR Mathematics OR Energy Fuels OR Physics OR Psychiatry). The timespan searched was 1990-2018. The searches were conducted using the following databases within the Web of Science Indexes: SCI-EXPANDED, SSCI, A&HCI, CPCIS, CPCI-SSH, and ESCI. For the clustering techniques adopted for this paper data are denoted as follows; c_i represent assigned nodes, $\delta(c_i, c_j)$, function = 1 if $c_i = c_j$ and 0 other, and γ denotes the resolution parameter that determines the details of the clustering, meaning the value of γ , determines the level of clustering details, hence, the model is expressed as; Van Eck and Waltman (2014).

$$(1) \quad V(c_i, \dots, c_n) = \sum_{i < j} \delta(c_i, c_j) (s_{ij} - \gamma) \quad (2) \quad s_{ij} = \frac{2ma_{ij}}{k_i k_j} \quad \text{where } a_{ij} = a_{ji}, \quad (3) \quad k_i = \sum_j a_{ij}, \quad m = \frac{1}{2} \sum_i k_i \triangleright$$

Whereby, the normalization of the weights of the constructs strength (cf.2) of the network nodes edges i and j , K_j (K_j). In addition, S_{ij} denotes similarity of i and j nodes which represents the total weight of nodes i (node j) and m denotes the total weight of the network (Van Eck and Waltman, 2009; 2011; 2014; 2016).

Findings and Discussions

The results were presented base on the study objectives.

Co-Citation Analysis

This section presented the co-citation analysis based on fractional counting method, and the unit of analysis ($n = 113,524$) cited references. We set the minimum citation of cited reference to five, meaning that cited references with less than five citations were not included in this section. For this reason, ($n = 557$) cited references co-citation analysis was presented below, and the top 500 with a total strength of the co-citation links were displayed in Figure 1. Surprisingly, only Library Philosophy and Practice, MIS Quarterly and Communication Journal were the major Library and Information Sciences Journal sources linked to microscopic studies in all these clusters. Although Journal of Social Science and Mediterranean Journal of Social Sciences were within the eight clusters consisting of 32,049 links and total link strength of 16,101.76 in the network visualization.

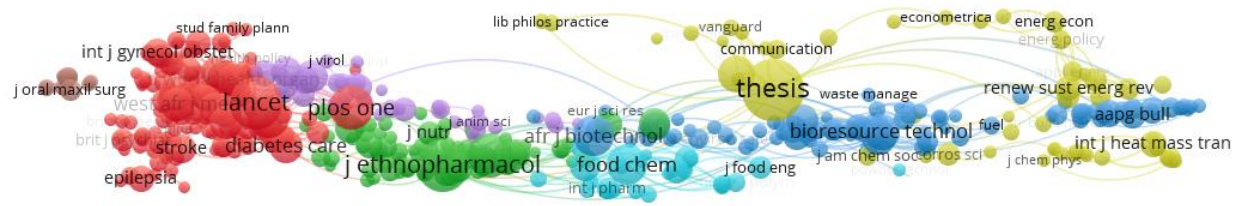


Figure 1a: Co-citation base on cited sources

From the table one, the prominence and visibility of the most prolific authors in this field were presented and the TLS of their outputs. The outputs indicated that South African scholars were among the prominent scholar and authorities in the niche area under study.

Table 1: Co-citations and TLS of the most prolific on ethnomedicine and other search strings used (cf. methodology). The display was arranged base on the citations and not the TLS to show the prominence of the outputs visibility

Author	citations	total link strength (TLS)
Singh, J	171	111.09
Farombi, EO	127	105.53
Jha, BK	108	60.29
Igwe, O	82	60.07
Misra, HP	80	80
Gureje, O	77	54.61
Sheikholeslami, M	74	37.58
Osinubi, KJ	72	32.85
Folayan, Mo	59	27.4
Habig, WH	56	56
Iorio, L	56	41.73
Lowry, OH	55	51
Sharma, RK	53	46.05
Adedara, IA	52	46.24
Onwujekwe, O	52	21.14
Oyedeji, GA	51	27
Iwu, MM	45	39.66
Araoye, MO	45	31.33
Lorke, D	44	41
Attama, AA	44	27.63

Furthermore, we conducted a co-citation analysis base on cited authors and fractional counting method of VOS bibliometric tool. The minimum number of citations threshold per an author was set to ten, meaning that an author with less than ten citations out of the total number of authors ($n = 84,753$) authors, which showed that many articles had a considerable number of authors. Nevertheless, only 643 authors had citations more than ten, which also indicated that citations were very low. This low citation trend seems to validate the assumption of this study, which suggest that information dissemination about the usefulness of these outputs were very low. Therefore, the

importance of engaging information professionals to help the scholars working on ethnomedicine and indigenous plant/herbs with the classification, knowledge organization, indexing, information packaging and dissemination strategies to promote the use of ethnomedicinal breakthrough and potent herbal products that may be useful to enhance public health systems.

The World Health Organization citations had the highest total link strength of 321.46 from 440 citations base on the co-citations analysis, making articles from this organization the most prominent outputs regarding the subject on our search strategies. The second and third strongest total link strengths (TLS) were from authors still as “who” with 324 citations, TLS =258.19 and “*who” with 173 citations, TLS =144.68. Perhaps based on the difference in research areas covered.

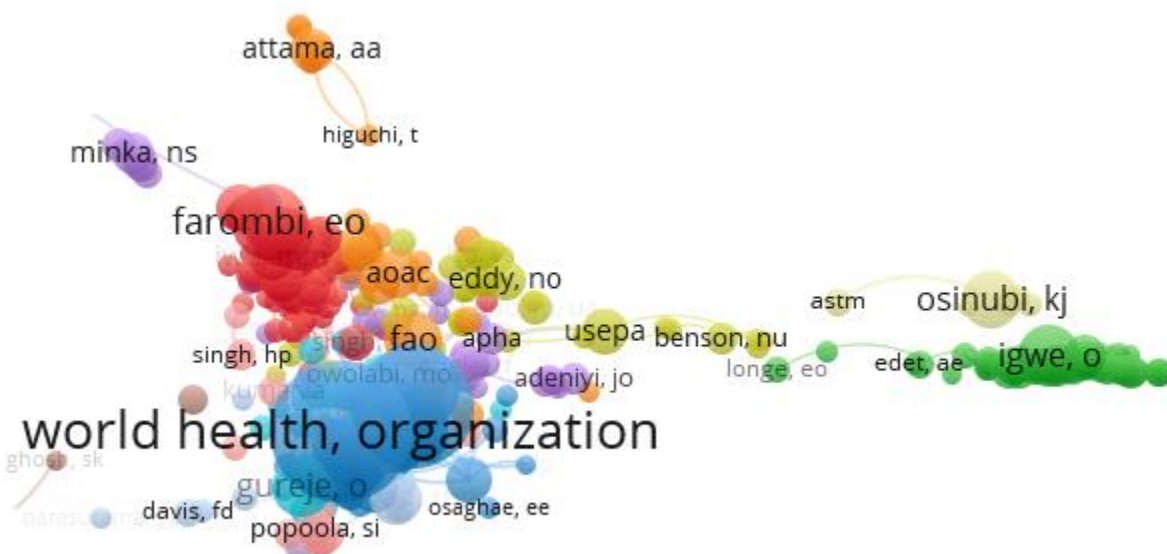


Figure 2: Co-citation and Total Links Strength of institutional -co-citations

Outputs by Institutions

The outputs by the institutions in this study were presented base on the co-authorship as this shows not just the quantities of outputs produced by each organization. It shows the relationship between one author between one institution as well as the number of their research productions. Due to a large number of data, we chose an organization with at least five articles per organization, and 105 institutions were selected out of 690 organizations. Based on the outputs trends, institutions within Nigerian institutions were the predominant contributing organization base on the total outputs and co-authorship. Meaning, there is the likelihood of higher trends of collaborations within Nigeria institutions compared with South African Institutions.

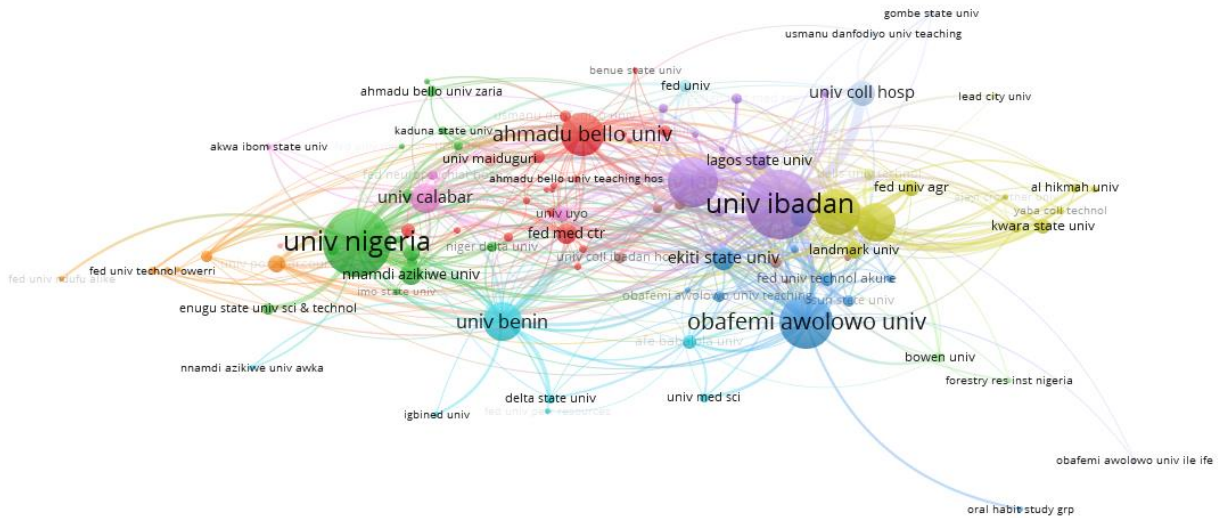


Figure 3: Outputs by Institutions. The colors showed the relatedness and co-authorship patterns based on their output

Most Prolific Authors

Authors	Record Count	% of 8,333	Bar Chart
Jonas JB	71	0.852 %	
Murray CJL	69	0.828 %	
Yonemoto N	69	0.828 %	
Qorbani M	67	0.804 %	
Kasaeian A	66	0.792 %	
Vos T	66	0.792 %	
Malekzadeh R	64	0.768 %	
Naghavi M	64	0.768 %	
Ukwaja KN	64	0.768 %	
Farombi EO	63	0.756 %	
Sepanlou SG	63	0.756 %	
Hay SI	62	0.744 %	
Mokdad AH	61	0.732 %	
Khader YS	60	0.720 %	
Khang YH	60	0.720 %	
Rafay A	58	0.696 %	
Sartorius B	57	0.684 %	
Rai RK	56	0.672 %	
Fischer F	54	0.648 %	
Topor-Madry R	54	0.648 %	
Uthman OA	54	0.648 %	
Folayan MO	53	0.636 %	
Miller TR	53	0.636 %	
Bedi N	52	0.624 %	
Gupta R	52	0.624 %	

(35,970 Authors value(s) outside display options.)

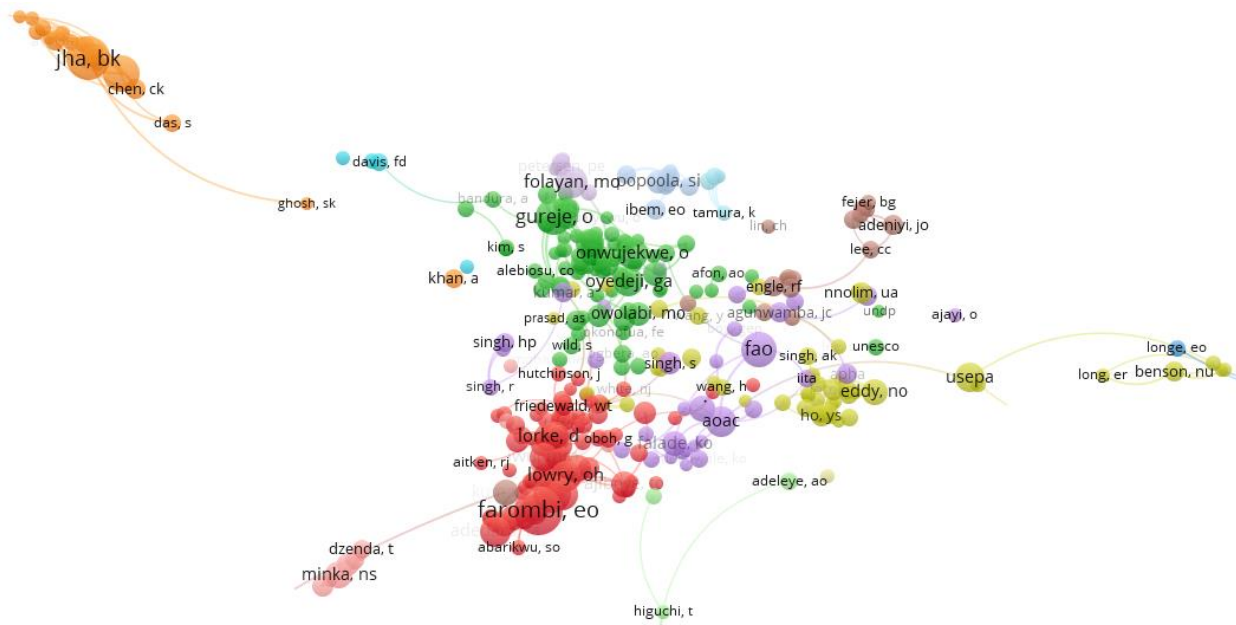


Figure 4: Co-citation network visualization of the top cited authors.

Outputs by Subject Areas

The analysis showed that output in the field of Library and Information was ranked 23rd out of the top 25 top subject areas although Social Sciences was listed in the 20th place.

Table 2: Distribution of Output Trends base on Research Outputs

Research Areas	Record Count	% of 8,333	Bar Chart
General Internal Medicine	801	9.612 %	■
Public Environmental Occupational Health	714	8.568 %	■
Pharmacology Pharmacy	689	8.268 %	■
Agriculture	550	6.600 %	■
Environmental Sciences Ecology	534	6.408 %	■
Food Science Technology	329	3.948 %	■
Business Economics	303	3.636 %	■
Plant Sciences	302	3.624 %	■
Health Care Sciences Services	258	3.096 %	■
Infectious Diseases	256	3.072 %	■
Veterinary Sciences	203	2.436 %	■
Neurosciences Neurology	200	2.400 %	■
Toxicology	196	2.352 %	■
Pediatrics	185	2.220 %	■
Tropical Medicine	184	2.208 %	■
Microbiology	177	2.124 %	■
Biochemistry Molecular Biology	169	2.028 %	■
Obstetrics Gynecology	169	2.028 %	■
Integrative Complementary Medicine	159	1.908 %	■
Social Sciences Other Topics	152	1.824 %	■

Endocrinology Metabolism	149	1.788 %	
Biotechnology Applied Microbiology	144	1.728 %	
Information Science Library Science	144	1.728 %	
Cardiovascular System Cardiology	128	1.536 %	
Dentistry Oral Surgery Medicine	120	1.440 %	

(112 Research Areas value(s) outside display options.)
(1 records (0.012%) do not contain data in the field being analyzed.)

Terms Co-occurrence based on Title and Abstracts

We created a network map base on the co-occurrences of all keywords in the entire text. This system employed text-mining capabilities of the VOS algorithm to generate the visualization, and for items to be selected, the terms must at least, appeared eight times. So, out of 17,149 keywords ($n = 17,149$), only 520 keywords occurred at least eight times, and the top 500 keywords with the stronger co-occurrence link were selected for analysis. The co-occurrence is useful to show the number of outputs or journals in which two terms co-occurred (cf. Figure 5).

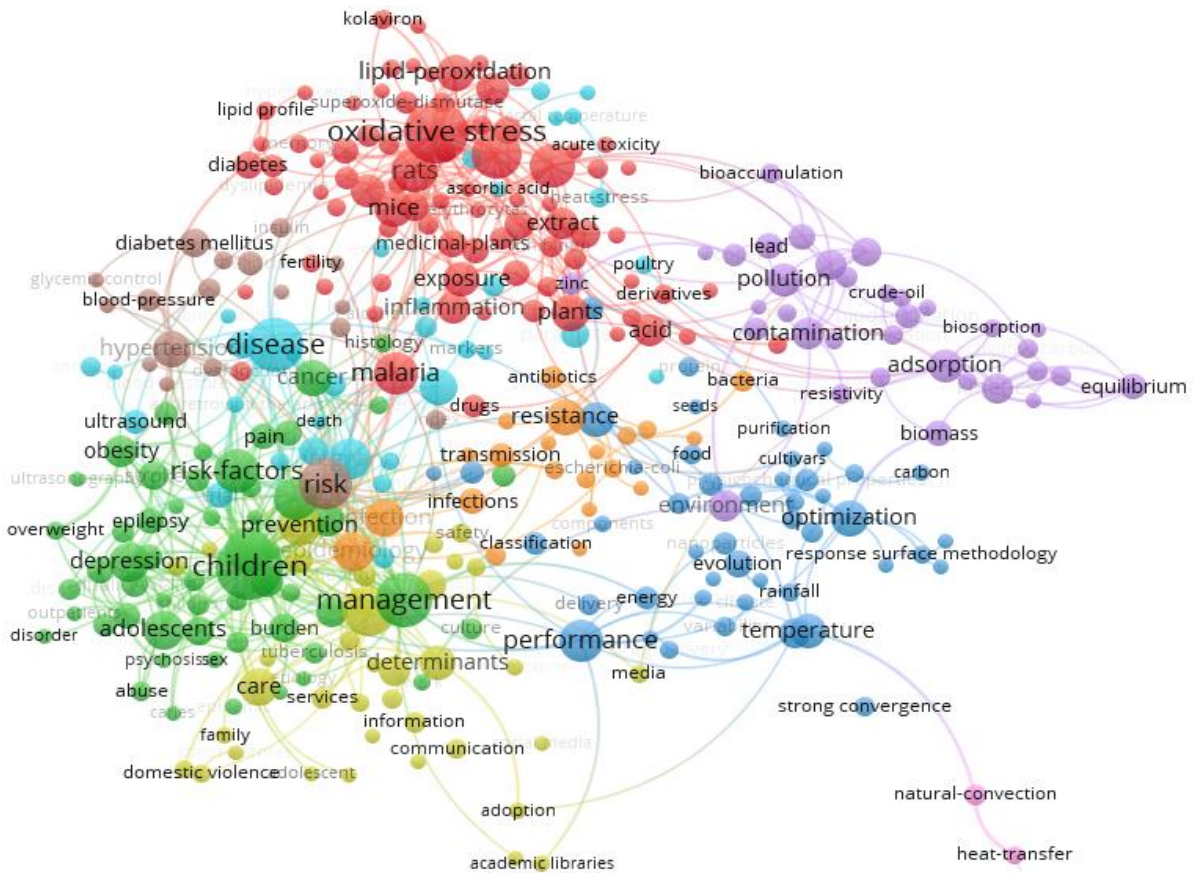


Figure 5: Co-occurrences of Terms. The color showed the relationship of terms within the cluster network

The implication of the studies

The first implication of these findings is the apparent lack of synergies between the information professionals and scholars in the field of ethnomedicine practice, ethnomedicine, indigenous knowledge management systems, and information science professionals. Nevertheless, the library and information science could assist in indexing, ontology development, classification and knowledge organization of crucial discoveries in these fields and help in disseminating these findings and information to various audiences. The second implication is that, without the ability to understand the importance or contributions of information management in promoting indigenous herbal products, there might not be collaborations among scholars across different fields of natural and social sciences, especially in natural and medicinal studies and information science. It is essential for the advancement of knowledge and creating natural remedies that might be potent to cure or manage widespread diseases in Africa through ethnic-base treatment. However, without the ability to use useful knowledge classification tools and techniques, most of this knowledge might be lost without proper documentation of the process, procedures, and the significant migration of the data hardware and storage platforms may not be handled appropriately.

Conclusion and Recommendation

The paper concludes that there are no established trends between information management, information practices, and ethnomedicine discipline. Hence, some of the professional tools technical prowess that could be useful to aggregate knowledge, classify and organize knowledge generated on ethnomedicine cannot be implemented. Nevertheless, the use of indigenous knowledge management system of healthcare deliveries must be promoted through appropriate information packaging and dissemination. The study recommends that collaboration and partnership must be cultivated between Information Studies and Library Science and others in the area of indigenous and ethnomedicine to enhance the appreciation of African rich biodiversity. South African institutions must increase their collaboration and co-authorship to increase their visibilities and prominence beyond the current level.

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