

Comparison of Intellectual Structure of Knowledge in International Journal of Preventive Medicine with MeSH: A Co-Word Analysis

Abstract

Background: The aim of the current study is to determine the Comparison of intellectual structure of International Journal of Preventive Medicine (IJPM) with Medical Subject Headings (MeSH) based on author keywords and index terms of Scopus database and the degree of compatibility among these two groups of keywords. **Methods:** This study was carried out using a co-word technique, which is one of the bibliometric methods. The study population consisted of 1104 articles published in IJPM and indexed in Scopus database. After retrieval the articles, data for co-word analyses was extracted using UCINET and VOSviewer software applications and centrality criteria. Then, the compatibility of author keywords and MeSH terms was examined by Jaccard's similarity index. **Results:** During the investigated years and among 2402 author keywords, on average, 561 author keywords (23.36%) were exact matches, 417 author keywords (17.36%) were partial matches, and 1424 author keywords (59.28%) were not matched with the terms contained in the index. Author keywords matching or not matching with index-term categories formed the largest portion of partial match keywords. **Conclusions:** The use of MeSH as a standard tool by medical journals for the selection of keywords in scientific publications could improve the visibility and retrieval of articles, and increase the number of citations and journals' impact factor.

Keywords: Abstracting and indexing as topic, knowledge, medical subject headings

Introduction

Evaluation and analysis of scientific fields are impossible without using quantitative criteria. The criteria used in common analyses in the fields of bibliometrics and scientometrics include bibliographic coupling, citation analysis, co-authorship analysis, and co-word analysis. The approach of this study is a co-word analysis.^[1] Co-word analysis is one of the techniques for co-occurrence analysis, which is one of the important methods in bibliometrics used to determine the relationship between concepts, thoughts, as well as problems in natural and social sciences.^[2] Co-word analysis can help to determine the main topics in the area of investigation, conceptual structures, and temporal development of publications in that area.^[3] One of the essential requirements for co-word analysis is the assumption that the words that are more frequently used have more influence in any area compared to the words that are used less frequently.^[4] Other assumptions include

authors carefully select their words in scientific works, the used words are directly related to their content, the words in any text determine the semantic relations of the topic and its domain, and the descriptive keywords that are indexed by the trained indexers are considered as the appropriate resources for co-word analysis.^[5,6] Studies have used co-word analysis to investigate conceptual network in areas including stem cell research^[7] and anticancer research.^[8]

Using correct words or appropriate indexing of the documents is one of the important areas in medical studies. Appropriate indexing of the documents in medical studies means the use of Medical Subject Heading (MeSH) in keywords selection, which is a standard tool used by many medical journals for the selection of keywords in scientific works.^[9] Use of these terms can lead to the better and fast retrieval of the papers and increasing their citation counts and consequently getting high impact factor for the journal.^[10,11] Various studies have compared the keywords used in medical studies with standard tools. The study by Masoudi and

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Ghazi Mirsaed (2016) regarding the compatibility between keywords in the Journal of Paramedical Sciences with MeSH showed that only 24.2% of keywords were fully compatible with MeSH.^[12] Another study by Kim *et al.* showed that the compatibility of keywords used by articles published in the Journal of Health and Medical Health Sasang, South Korea, with MeSH was only 15.2%.^[13] Roh in another study investigated the compatibility between keywords of the Journal of Medical Physics Society of South Korea with MeSH and showed that only 21.8% of the keywords had full compatibility with MeSH.^[14] To this end, the current study aims to determine the comparison of intellectual structure of the International Journal of Preventive Medicine (IJPM) with MeSH. IJPM is one of the journals published by Isfahan University of Medical Sciences, which is indexed by the top databases such as Web of Science, Scopus, and PubMed based on author keywords and index terms in Scopus to investigate their compatibility. Therefore, the main research questions are as follows:

1. What is the intellectual structure obtained from a co-word analysis of author keywords in IJPM?
2. What is the intellectual structure obtained from a co-word analysis of Scopus index terms in IJPM?
3. What is the degree of compatibility between author keywords and index terms of Scopus database in IJPM?

Methods

The population of this study consisted of 1104 articles published in IJPM until February 2nd, 2017 and indexed in Scopus database. The search query was “International Journal of Preventive Medicine” in the database. After conducting the search, two data files were created as the output. One file contained author keywords and the other file covered index terms of Scopus database. One of the characteristics of Scopus database is the use of the index terms extracted from academic indexes to facilitate article retrieval. To this end, Scopus database manually adds index terms to more than 80% of its indexed articles. These index terms are determined by a professional indexing team based on a specialized thesaurus. For example, Emtree medical terms, species index, and MeSH are used for articles in the areas of life sciences and health sciences. After the retrieval of data, co-word analysis was carried out using UCINET^[15] and VOSviewer^[16] software applications. Furthermore, for a comparative study of the two groups of keywords, first, important and practical words were extracted. The identification of important words was done by the centrality indicators.

Centrality indicators including degree, closeness, and betweenness centralities were used for data analysis. Degree centrality is defined as the number of links connecting a word with its peers (i.e., the number of ties a word has). The number of links (degree) is the frequency of co-authorship. This is the easiest and most effective

indicator of a subject's centrality. Subjects are distinguished in terms of the links they establish, i.e. the importance grows as the links increase.^[17] Closeness centrality is the shortest path between a subject and its peers in the network. In contrast to the degree centrality that addresses the number of direct links to a subject, closeness centrality calculates the distance between subject and other subjects, with an eye on the distance with all the subjects on the network, regardless of the links being direct or indirect.^[15] Betweenness centrality deals with the suitable place of a subject in a range between the other subjects present in the network. In other words, the betweenness centrality is the frequency of a subject going between other subjects in a network and linking them in the process.^[17]

Then, to investigate the proximity of keywords, we need ways to describe populations of MeSH terms and author keywords, and their relationships, mathematically. The Jaccard's similarity index is a way to compare groups by determining what percent of keywords identified were present in both groups.^[18]

Results

Co-word analysis of author keywords

Co-word analysis of author keywords in IJPM journal based on centrality indicators showed that Obesity (119), Prevention (96), Adolescents (85), Children (82), and Prevalence (81) were in the first to fifth places based on degree centrality indicator. Furthermore, betweenness centrality showed that Obesity (45.826), Prevention (29.367), Prevalence (19.283), Metabolic Syndrome (14.75), and Children (13.876) were in the first to fifth places while closeness centrality showed that Stroke (168), Breast cancer (99), Women (73), Quality of life (70), Risk factors (67), and Students (67) were in the first to fifth places [Table 1].

Cluster analysis of author keywords in IJPM showed that Child, Glucose, Relevance, Risk factor, and High-risk population are the most important keywords in the co-word map. In this co-word map, words with closer relations are closer to each other, whereas words with less relation are further away from each other. The density of terms cluster is determined based on its number of term frequencies and number of neighboring terms and their importance. The spectra from red to blue show highest to lowest densities for words in the co-word clustering map. In other words, words shown in red are those with the highest density [Figure 1].

Co-word analysis of index terms

Co-word analysis of index terms in IJPM based on centrality indicators showed that Adult (33073), Prevalence (29489), Risk factor (27953), Obesity (27321), and Sex difference (26914) are the keywords in the first to fifth ranks based on degree centrality indicator. Based

Table 1: Centrality indicators of authors' keywords in IJPM

No.	Authors' Keywords	Degree	Authors' Keywords	Betweenness	Authors' Keywords	Closeness
1	Obesity	119	Obesity	45.826	Stroke	168
2	Prevention	96	Prevention	29.367	Breast cancer	99
3	Adolescents	85	Prevalence	19.283	Women	73
4	Children	82	Metabolic syndrome	14.75	Quality of life	70
5	Prevalence	81	Children	13.876	Risk factors	67
6	Body mass index	79	Cancer	9.343	Students	67
7	Overweight	67	Hypertension	9.2	Epidemiology	63
8	Physical activity	65	Anxiety	9.033	Smoking	63
9	Hypertension	63	Body mass index	8.167	Depression	62
10	Cancer	61	Cardiovascular disease	6.95	Diabetes mellitus	62
11	Lipid profile	61	Adolescents	6.793	Children and adolescents	61
12	Metabolic syndrome	58	Lipid profile	6.45	Mortality	60
13	Anxiety	54	Physical activity	5.033	Diabetes	59
14	Diabetes	53	Diabetes mellitus	4.833	Type-2 diabetes	59
15	Cardiovascular disease	52	Type-2 diabetes	3.083	Cardiovascular disease	58
16	Blood pressure	49	Depression	3.083	Blood pressure	58
17	Mortality	48	Children and adolescents	2.926	Overweight	56
18	Children and adolescents	46	Overweight	2.833	Physical activity	56
19	Epidemiology	42	Smoking	2.5	Hypertension	56
20	Type-2 diabetes	42	Women	2.5	Anxiety	56
21	Depression	41	Diabetes	2.4	Cancer	55
22	Risk factors	39	Mortality	1.367	Lipid profile	55
23	Diabetes mellitus	31	Blood pressure	1.117	Body mass index	54
24	Smoking	27	Students	0.75	Adolescents	53
25	Students	27	Risk factors	0.726	Children	53

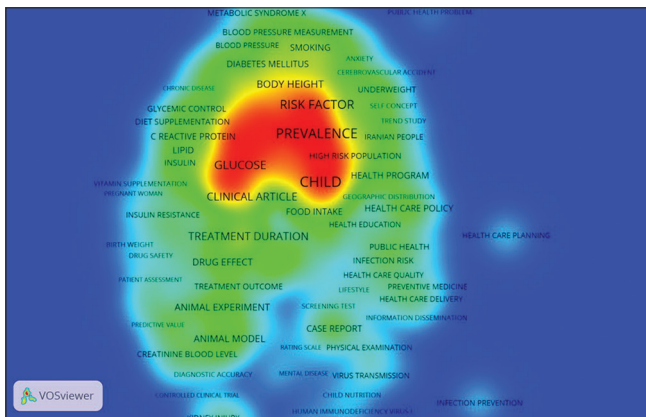


Figure 1: Map of co-words of authors' keywords in IJPM

on betweenness centrality indicator, Adult (1275.535), Prevalence (705.29), Risk factor (540.968), Obesity (506.957), and Sex difference are in the first five ranks, whereas Glucose (478), Diastolic blood pressure (477), Risk reduction (475), Healthcare policy (475), and Food intake (475) are in the first five places based on closeness centrality indicator [Table 2].

Cluster analysis of index terms in IJPM showed that Obesity, Overweight, Relevance, Prevention, Children, Body Mass Index, and Adolescents are the most important keywords in the co-word map [Figure 2].

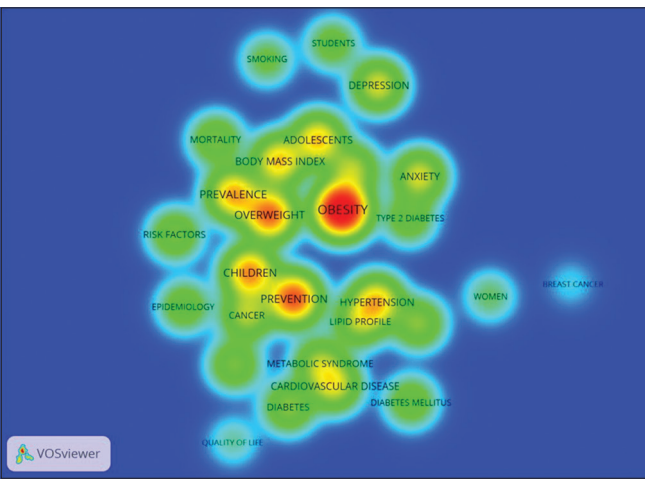


Figure 2: Map of co-words of index terms in IJPM

Discussion

The current study was carried out to determine the intellectual structure of IJPM since being indexed in Scopus based on authors' keywords and index terms of Scopus to determine the degree of their compatibility. Based on author keyword analysis, Obesity, Prevention, Adolescents, Children, and Prevalence were the first five important keywords based on degree centrality indicator. Based on the subject area of the journal, it appears that

Table 2: Centrality indicators of index terms in IJPM

No.	Index terms	Degree	Index terms	Betweenness	Index terms	Closeness
1	Adult	33073	Adult	1275.535	Glucose	478
2	Prevalence	29489	Prevalence	705.29	Diastolic blood pressure	477
3	Risk factor	27953	Risk factor	540.968	Risk reduction	475
4	Obesity	27321	Obesity	506.957	Health care policy	475
5	Sex difference	26914	Sex difference	496.624	Food intake	475
6	Physical activity	25914	Risk assessment	418.238	Systolic blood pressure	473
7	Risk assessment	25757	Physical activity	416.832	Incidence	470
8	Hypertension	24085	Disease severity	370.68	High-risk population	469
9	Treatment duration	23124	Treatment duration	356.661	Cardiovascular disease	465
10	Body weight	23464	Body weight	322.401	Diabetes mellitus	458
11	Health program	23199	Health program	319.827	Smoking	454
12	Disease severity	22762	Hypertension	308.708	Health survey	453
13	Cardiovascular risk	23438	Cardiovascular disease	276.385	Cardiovascular risk	451
14	Health survey	22395	Smoking	275.482	Disease severity	444
15	Smoking	22072	Health survey	253.736	Body weight	442
16	Diabetes mellitus	22694	Cardiovascular risk	234.261	Health program	442
17	Cardiovascular disease	21294	Diabetes mellitus	211.824	Treatment duration	440
18	High-risk population	21176	Incidence	210.474	Hypertension	440
19	Incidence	20894	High-risk population	195.921	Risk assessment	419
20	Systolic blood pressure	20935	Risk reduction	195.447	Physical activity	418
21	Food intake	20536	Health care policy	189.681	Sex difference	405
22	Health care policy	19434	Food intake	185.713	Obesity	403
23	Risk reduction	20203	Diastolic blood pressure	163.836	Risk factor	395
24	Diastolic blood pressure	20515	Glucose	155.078	Prevalence	372
25	Glucose	20358	Systolic blood pressure	152.141	Adult	323

a large portion of articles in this journal are related to preventive medicine and that many researchers concentrate on prevention of noncommunicable diseases, especially obesity, with emphasis on children and adolescents.

Cluster analysis of index terms in IJPM to identify the thought pattern in the area of preventive medicine using keywords Obesity, Overweight, Relevance, Prevention, Children, Body Mass Index, and Adolescents showed that these concepts have the highest importance in this area.

Analyzing a total of 1104 articles indexed in Scopus database by Jaccard's similarity index showed that during the investigated period, among 2402 author keywords, on average, 561 keywords (23.36%) were exact matches, 417 keywords (17.36%) were partial matches, and 1424 keywords (59.28%) were not matched with index terms. Keywords matching or not matching with index-term categories formed the largest portion of partial match keywords.

The results indicated that the compatibility of author keywords of the journal with MeSH was lower than 50%. Most other studies also report a lower than 50% compatibility with the results of the current study being closest to the one reported by Masoudi and Ghazi Mirsaeed (24.2%).^[12] It seems that authors must be familiarized with MeSH and the advantages of using these keywords. The technical team of the journal should also

manually check the compatibility of submitted keywords with MeSH and notify any inconsistencies to the authors to be fixed to improve the visibility of indexed articles.

The results indicated that less than one-fourth of keywords had a partial match. These results are similar to the results reported by Bahadori and Baniaghbal regarding English keywords used in dissertations (15.4%)^[17] and the results reported by Kabiri Zadeh *et al.* on the Mazandaran Journal of Medical Sciences (20%).^[19] However, results reported by Roh showed a (45.2%) partial compatibility, which is significantly different from the results obtained in the current study, and the results of Mirsaeid and Masoudi (2016) journals' keywords have a more partial match with MeSH terms.^[20] On the other hand, the results of the study by Kim *et al.* showed partial compatibility of 10.8%, which is significantly lower than the results of the current study.^[13] These results show that the majority of authors are not familiar with MeSH descriptors.

Regarding incompatible keywords, the findings indicated that more than half of all keywords are incompatible with MeSH. These results are in agreement with those reported by Kim *et al.* showing an incompatibility of 56.1%.^[13] However, the study by Roh *et al.* showed an incompatibility rate of 33%, which is significantly less than that of the current study^[14], whereas the study by Aram^[21] showed an incompatibility rate of 83%, which is significantly higher

than that of the current study. According to the results, despite the importance of MeSH keywords in increasing the visibility of articles, the awareness of authors regarding the use of these words is low. This means that additional training for authors in order to familiarize them with MeSH can help improve the current situation.

Conclusions

Co-word analysis is a technique to analyse the co-occurrences of keywords, as well as identify relationships and interactions between the topics researched and emerging new research trends. In the present study, the relationship between the MeSH terms and author keywords of IJPM journal was studied by co-word analysis. During the investigated years and among 2402 author keywords, on average, 561 keywords (23.36%) were exact matches, 417 keywords (17.36%) were partial matches, and 1424 keywords (59.28%) were not matched with index terms. Keywords matching or not matching with index-term categories formed the largest portion of partial match keywords. This result indicates that necessary education about documentary tools such as MeSH Thesaurus is not included in the curricula of the IJPM for authors, and it seems that a lot of authors only when submitting the paper to the journal notice that it is required to use MeSH. Finking's showed the use of MeSH thesauruses as a standard tool for keyword selection by medical journals can help improve the visibility and retrieval of the articles in scientific databases, and increases the number of citations and journal's impact factor.

Suggestions

We suggest that editorial staff of the journal compare author keywords of submitted articles to MeSH and in case of incompatibilities offer alternative suggestions to authors. This can increase the use of standard words, leading to higher visibility of the articles and higher H-index, which can also act as an incentive for authors to use these standard keywords.

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Conflicts of interest

There are no conflicts of interest.

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