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

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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 research⁷ 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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Keywords in the Journal of Paramedical Sciences with MeSH showed that only 24.2% of keywords were fully compatible with MeSH. Another study by Kim et al. showed that the compatibility of keywords used by articles published in 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. 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 IJMP?
2. What is the intellectual structure obtained from a co-word analysis of Scopus index terms in IJMP?
3. What is the degree of compatibility between author keywords and index terms of Scopus database in IJMP?

Methods

The population of this study consisted of 1104 articles published in IJMP 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 and VOSviewer 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. 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. 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.

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.

Results

Co-word analysis of author keywords

Co-word analysis of author keywords in IJMP 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 IJMP 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 IJMP 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
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].

| 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

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

**Discussion**

The current study was carried out to determine the intellectual structure of IJMP 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
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 Mirsaed (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 Banieghbal 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.[11] 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.

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**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  | Cardiabetic 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      |
Co-word analysis is a technique to analyze 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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