EDITORIAL

Disaster medicine research: Trends and Bibliometric Analysis

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ABSTRACT

Disaster medicine research: Trends and Bibliometric Analysis

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Major disasters have always occurred, but their increasing frequency over the last years has raised the importance of disaster medicine. Knowledge visualisation techniques, such as bibliometric maps, along with expert judgement, can help us identify the "blind spots" and eventually better prepare for such catastrophic events.

INTRODUCTION

Disaster means "catastrophe" and it origins from the Greek words "δυς" and "ἀστὴρ", which literally means "bad star"[1]. WHO has defined disaster as an event; natural or man-made, sudden or progressive, which impacts with such severity that the affected community has to respond by taking exceptional measures[2]. As included in the 1991 meeting the WHO Expert Committee on Emergency Relief Operations Disaster medicine is the study and collaborative application of various medical disciplines to the prevention, immediate response and rehabilitation of the health problems arising from disaster, in cooperation with other disciplines involved in comprehensive disaster management.

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Bibliometric analysis is defined as a statistical evaluation of published scientific articles, books, or chapters of a book, in order to quantitively examine the knowledge structure and development of research fields. Visually representation of scientific literature, based on bibliographic data, is called bibliometric mapping. Publications- based analysis is also an effectual way to measure the influence of publication in the scientific community[3-4].

This article presents a bibliometric analysis on the field of disaster medicine in an attempt to identify research trends and key subjects.

METHODS

A comprehensive bibliographic retrieval was performed online using the US National Library of Medicine PubMed Database at 01/12/2019. This was performed on a single day to avoid daily updating bias; since the database is still open. Search keywords were referred to MESH terms from PubMed, and the search terms used were: "disaster medicine"[MeSH Terms] OR ("disaster"[All Fields] AND "medicine"[All Fields]) OR "disaster medicine"[All Fields]. The data included a publication period between 01/01/1946 and 01/12/2019 was exported in MEDLINE and CSV format for further analysis.

The latter was performed via the use of two open software tools for bibliometric analysis: VOS Viewer v.1.6.13 (CWTS B.V., Center for Science and Technology, Leiden University, The Netherlands ®). Due to the relatively small network, the graph-based approach was selected. In the latter nodes are positioned in a two-dimensional space, just like in the classical distance-based approach. The difference between the two approaches is that in the graph-based approach edges are displayed to indicate the relatedness of nodes. The distance between two nodes need not directly reflect their relatedness. For constructing and visualizing bibliographic network of researchers we used co-authorship type of analysis, where the relatedness of items is determined based on their number of co-authored documents. As units of analysis "authors" is used and fractional counting method is selected. Thus, the weight of a link is fractionized: e.g. if an author co-authors a document with 10 other authors, then each of co-authorship links has a weight of 1/10. Maximum authors allowed per document were 25, while we choose the default minimum number of 5 publications for a researcher, in order to be included in the network. For identifying research interests keyword co-occurrence analysis was selected (i.e. the relatedness of items is determined based on the number of documents in which they occur together). Full counting was chosen, and two approaches were used: one used as unit of analysis authors keyword and another MeSH terms[5]. Extensive details about normalization, mapping, and clustering techniques used by VOS viewer, are beyond the scope of the present article[5].

Data about mass disasters were also retrieved from EMDAT, OFDA /CRED International Disaster Database, (Louvain University, Belgium), so as a parallel comparison of publication activity with the incidents of disaster could be feasible[6].

RESULTS

The search retrieved 9496 publications for the time interval of 73 years. Publications time course seems to be in accordance with the disaster incidents for the same time window (Figure 1 and Figure 2).

Figure 1. Trends in the number of documents published annually.

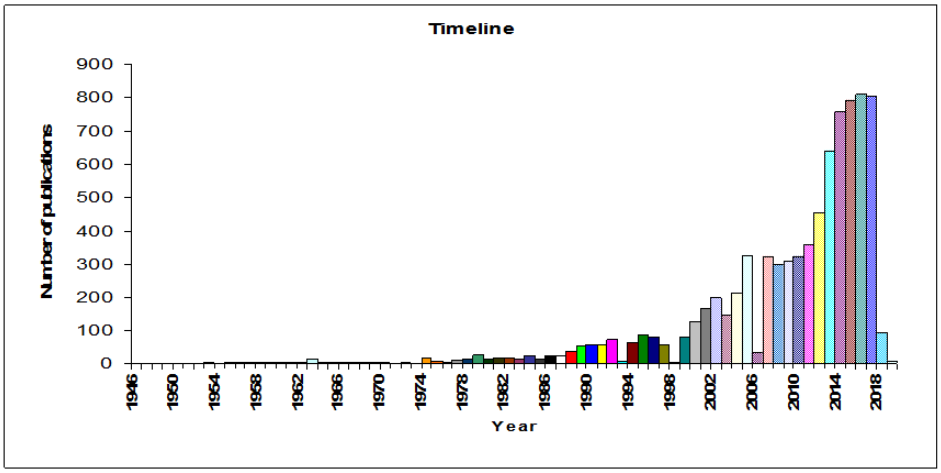
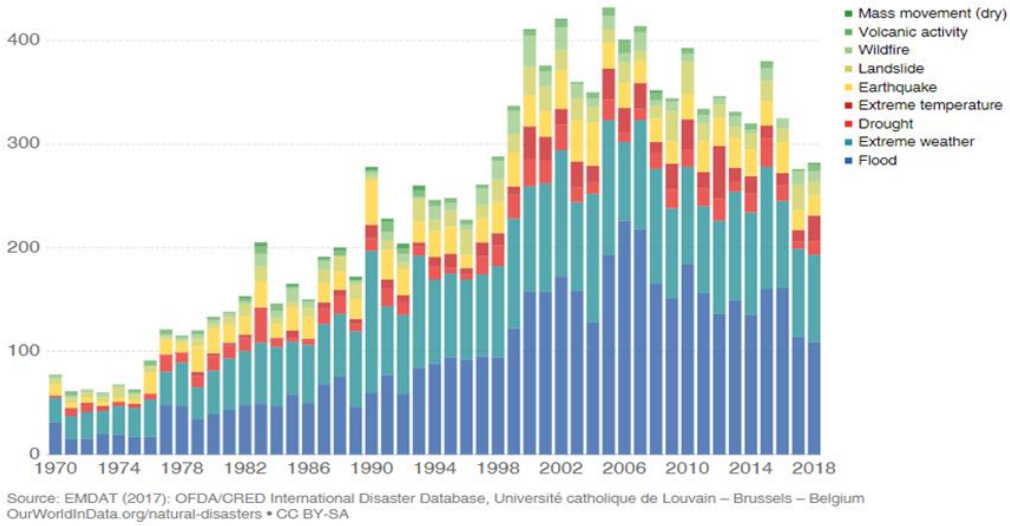
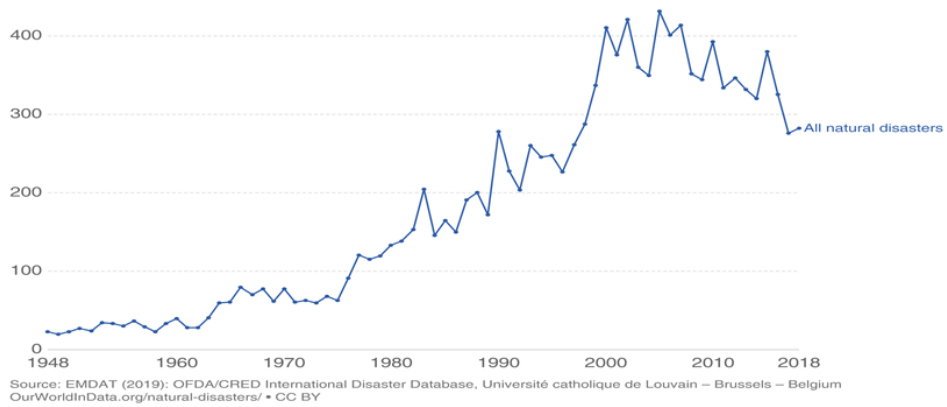
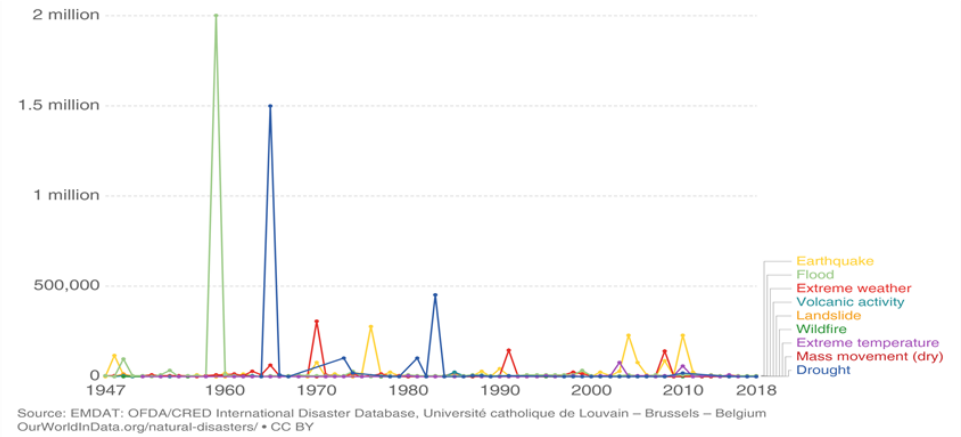


Figure 2. The annual reported number of natural disasters (above), categorised by type (middle) for the years 1970-2018 and global deaths from natural disaster (bottom), as recorded in EMDAT database[6].







The ten most active journals in the field are displayed in Table 1, while the authors with the more publications are seen in Table 2.

Table 1. Most active journals in the field of disaster medicine, based on the number of papers published.

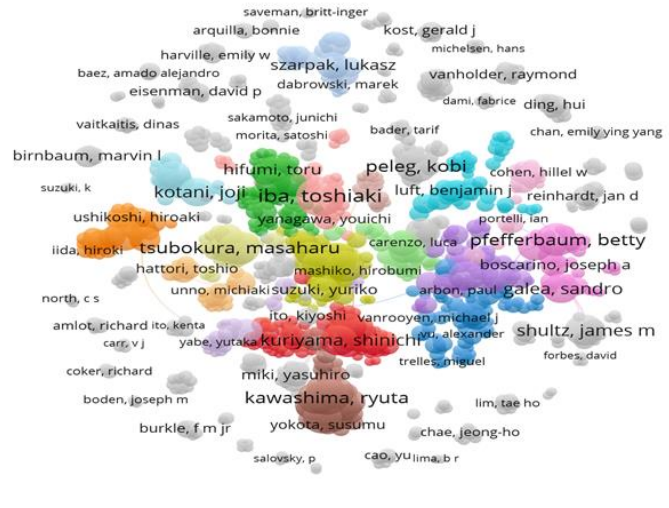
Journal Name	**Number Articles**	**Time interval**
Prehospital Disaster Medicine	**1057**	**1990-2019**
Disaster Medicine and Public Health Preparedness	**594**	**2007-2019**
American Journal of Disaster Medicine	**210**	**2010-2018**
PLOS One	**135**	**2008-2019**
Military Medicine	**121**	**1958-2019**
Annals of Emergency Medicine	**111**	**1982-2018**
American Journal of Emergency Medicine	**98**	**1988-2019**
VoennoMeditsinksiiZhurnal	**81**	**1990-2019**
Journal of American Veterinary Association	**74**	**1956-2019**
International Journal of Environmental Research and Public Health	**71**	**2008-2019**
Journal of Emergency Medicine	**57**	**1985-2019**
The Lancet	**50**	**1980-2019**

Table 2. Most active authors in the field of disaster medicine, based on the number of papers published.

Author	**Papers**
Iba Toshiaki	**84**
Kawashima Ryuta	**65**
Tsubokura Masaharu	**58**
Pfefferbaum Betty	**58**
Taki Yasuyuki	**56**
Takeuchi Hikaru	**55**
Kotozaki Yuka	**54**
Yasumura Seiji	**54**
Nouchi Rui	**52**
Ogura Shinji	**52**

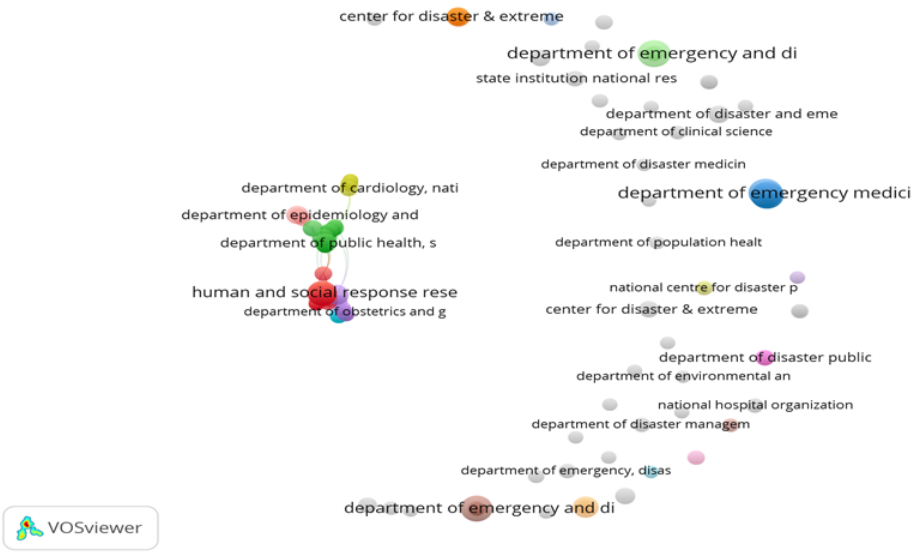
Bibliographic coupling network of researchers is displayed in figure 3. In our data search, there were 28913 authors, of which 1172 met the threshold. The final visualization excluded 172 authors with no or small bibliographic coupling relations with other researchers. Moreover, only 815 items were connected.

Figure 3. Bibliographic coupling network of researchers (clustered): analysis retrieved of 76 clusters. Researchers with small or no connection are displayed in the periphery of the network.



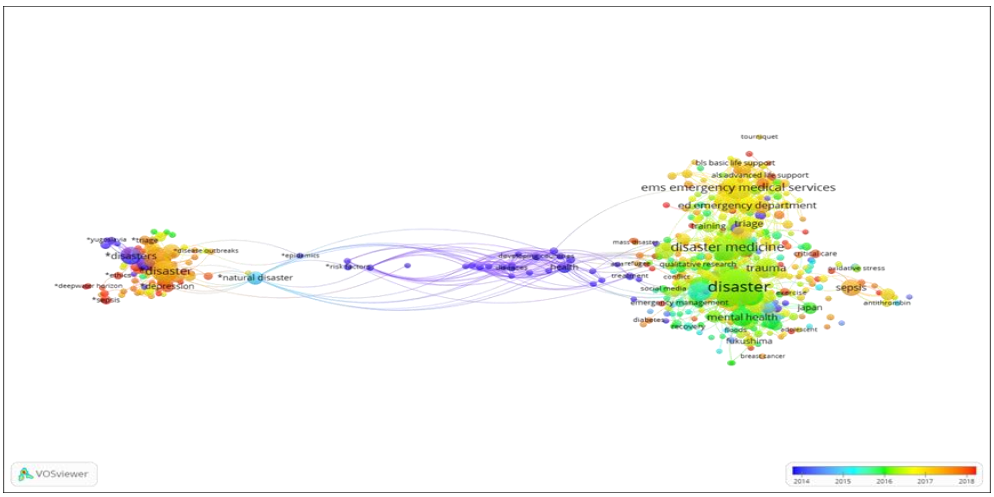
The same analysis method was used for organizations. Out of 19746 organizations, only 150 met the threshold. Of those, the largest set included 66 connected items. (Figure 4).

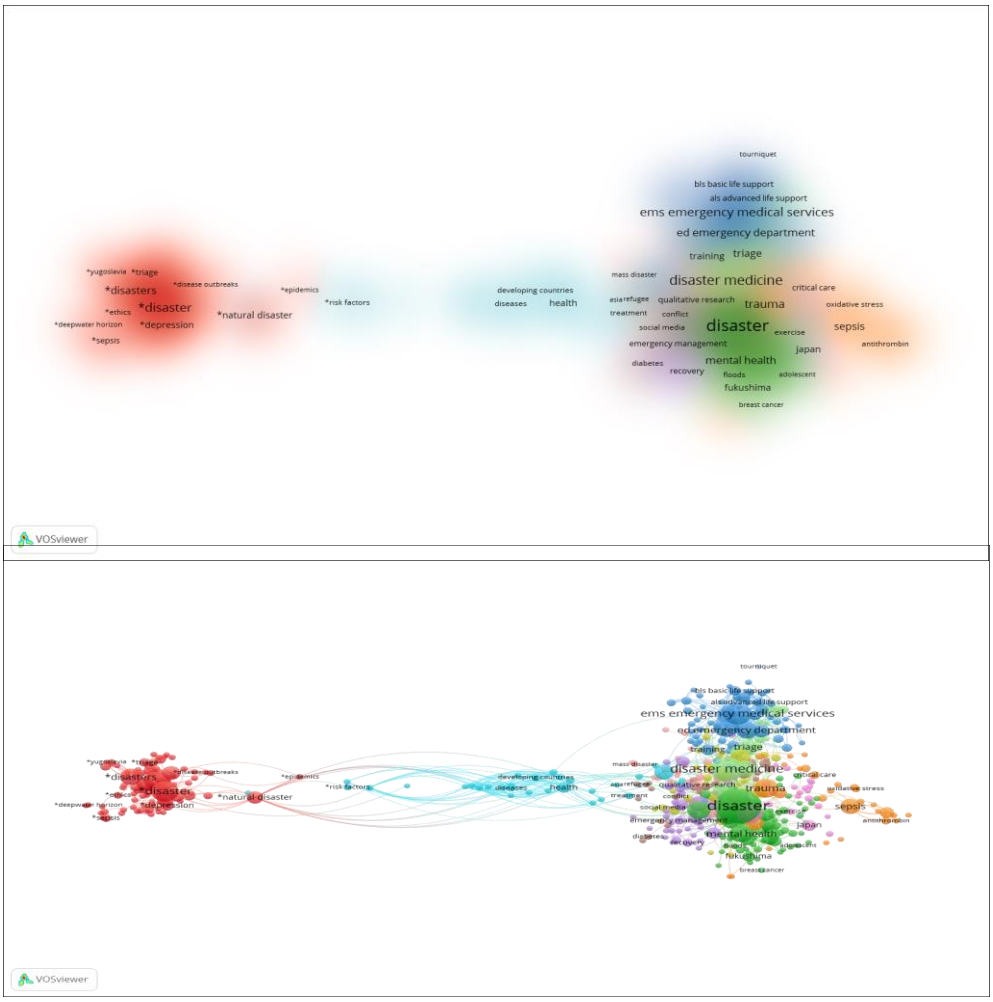
Figure 4. Bibliographic coupling network of organizations.



In the co-occurrence author keywords analysis 10095 keywords were identified, 466 of which met the threshold of 5 as minimum number of occurrences of a keyword. We chose to visualize the largest set, which included 461 connected items. Three maps were created: simple Network Visualization which identifies 12 clusters (colored differently), Overlay Visualization (were terms which appeared earlier are colored purple or blue and terms that which appeared more recently are colored yellow, orange and red) and cluster density map , where cluster are more distinguished. (Figure 5).

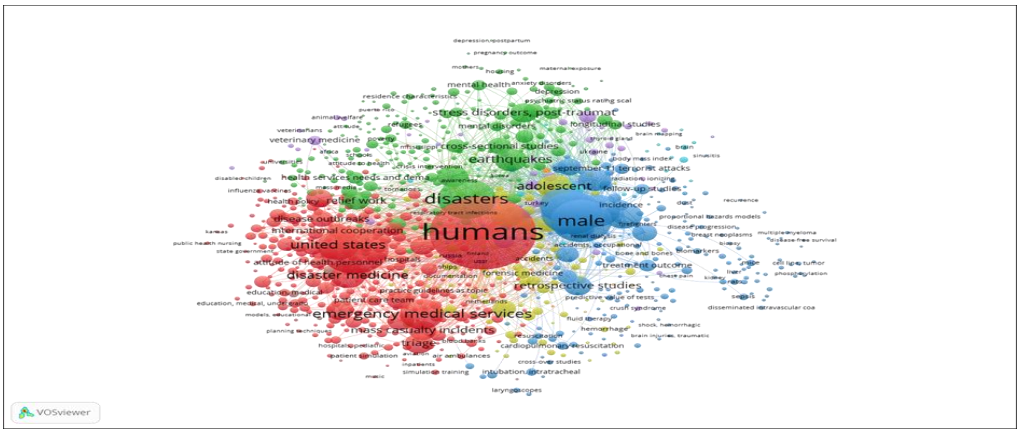
Figure 5. Co-occurrence authors Keywords mapping: Network (above) , Overlay (middle) and Cluster Density Visualisation (bottom).

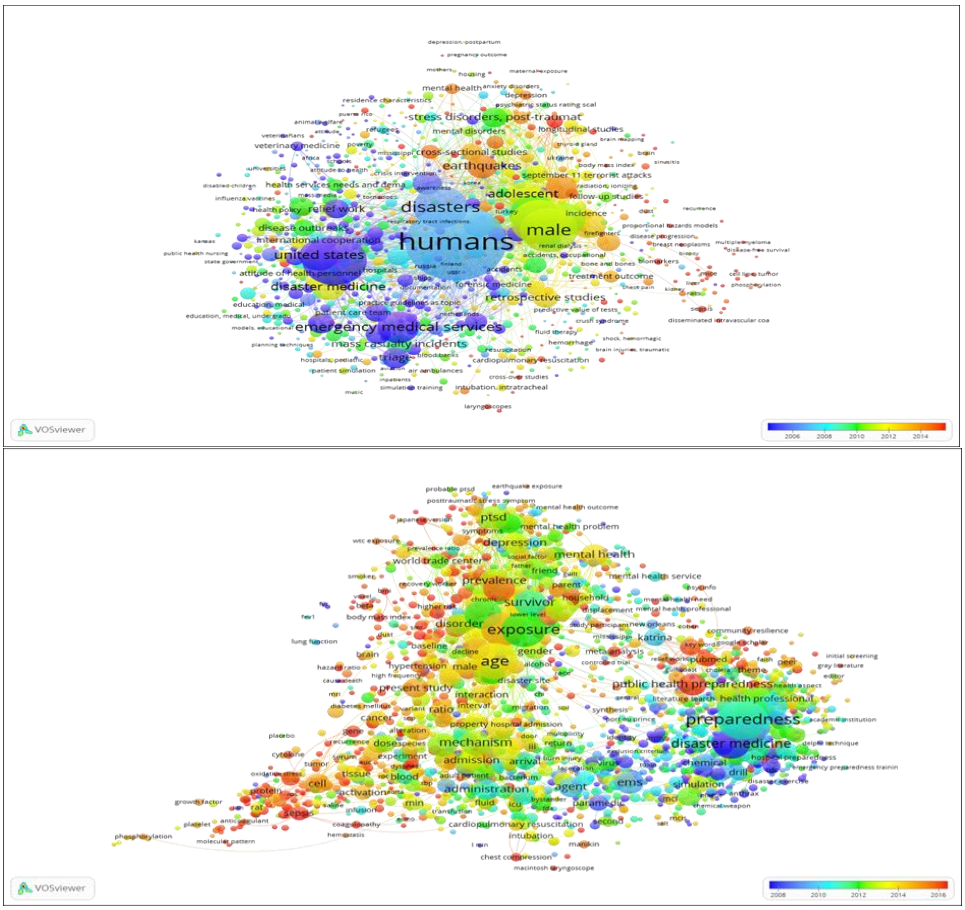




In the co-occurrence MeSH keywords analysis 6075 keywords were identified, 1816 of which met the threshold. We chose to visualize the largest set, which included 1000 connected items (9 clusters). (Figure 6.)

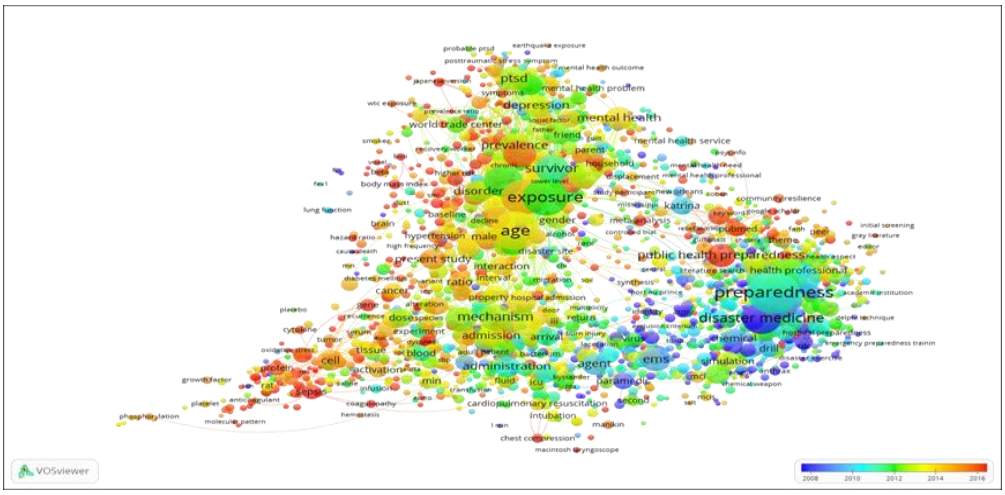
Figure 6. Co-occurrence MeSH Keywords mapping: Network (above) and Cluster Density Visualisation (bottom).

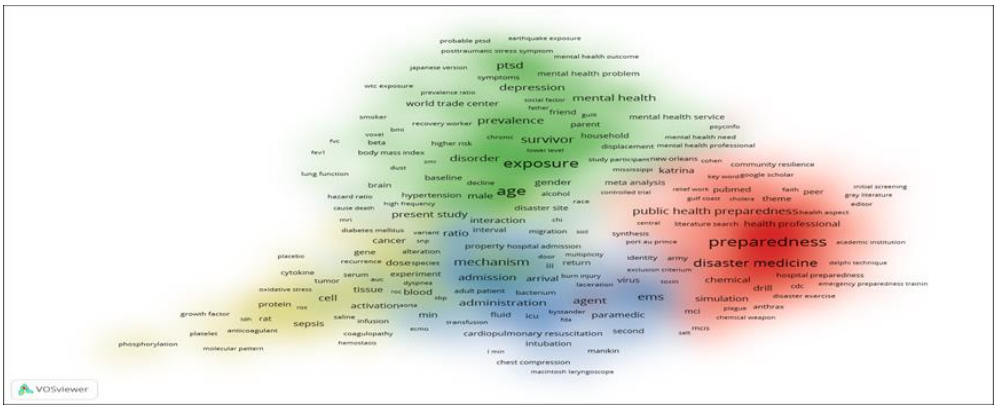




Finally, a map of co-occurrence terms network was constructed based on Title and Abstract content (Figure 7). The visualisation contains 2291 items, classified into 6 clusters.

Figure 7. Overlay visualisation(above) and cluster density visualisation (bottom) of Title and Abstract terms.





DISCUSSION

The above analysis reveals that, though disasters are a companion to human history, disaster medicine is a relatively novel research field. The latter may be explained by the fact that disaster incidents are steadily increasing after 1970. This coincides also with the rise in emergency medicine. While most papers are published in United States Journals, most active authors come from Japan. Based on Keywords mapping, using Authors, MeSH items and combing them with those form Title and Abstract, research focus has moved from disasters and their health consequences descriptions (especially events with extend media coverage, such as 9/11 and Katrina Hurricane) to emergency medicine systems response. More recently, as it becomes clear that mass disasters are becoming more often than previously public health preparedness related subject is gaining more interest. Yet, it should be noticed that disaster medicine is an interdisciplinary area, and that the latter is obvious by the diversity of the research focus.

The strength of a bibliometric network visualization like is in the simplification it provides, but simplification comes at a cost. Thus, limitations of the above analysis should also be considered when interpretation its results.

Visualisation typically implies a loss of information due to several reasons: i) primary data "carry" the limitations of the database that they were retrieved. In our case, the data were extracted form only one database, which does not contain the sum of the available literature about the subject. The last-mentioned is mainly related to journals' and database's policies. ii) When textual data is reduced to a co-occurrence network of terms, information on the context in which terms co-occur is lost. iii) In the case of graph-based visualizations, we may need to restrict ourselves to visualizing a limited number of nodes, for instance the nodes with the highest degree in a network. The problem with the loss, is that we can estimate neither the amount nor the weight of lost information. Finally, analysis results, may vary

when different methods are used. The importance of that variation has not examined in the above analysis.

CONCLUSION

Bibliometric analysis can provide insights into scientific research, which can be used not only for descriptions, comparisons and visualisation of research output in disaster medicine; but also, for identifying possible targets for future research. The latter, when combined with real incidents database analysis, can help health systems and policy makers better understand andprioritise the available evidence of mass disaster knowledge. Since the impact of such events is growing, combination of various information analysis techniques are becoming more of necessity than a complement tool for future decision making.

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