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Original article

Methodological pluralism or multimethod research in health and medical sciences

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Summary

Introduction. With the development of medical and health sciences, research problems have become more complex, and relying solely on quantitative or qualitative research approaches is no longer sufficient. The aim of this paper was to map the progress and trends in the scientific literature regarding the application of mixed studies in medical and health sciences.

Methods. Bibliometric analysis was applied to meet the established goals. The Dimensions database was selected for literature search. The analysis unit consisted of 485 publications of various types, and the VosViewer program was employed for the analysis.

Results. The results have shown that this topic in science has experienced an exponential decline in the last year. Additionally, the most productive authors, journals, and countries have been identified, along with their collaborative networks through visual co-citation analysis. Based on the analysis of word co-occurrence, we can conclude that words like "combined studies," "problem," "factors," "community" are most frequently repeated, indicating that the topics addressed in this domain mainly focus on investigating and addressing numerous issues in the field of medical and health sciences.

Conclusion. Although the results indicate a decreased interest in this topic in the last year, it does not diminish the significance of this research. Progress in medical and health sciences requires a comprehensive approach to research, which includes both quantitative and qualitative methods, such as mixed studies. Understanding the current trends and available resources for researchers assists in achieving better outcomes and improving the quality of healthcare practice.

Keywords: mixed studies, medical sciences, health sciences, VosViewer

Introduction

With the development of medical and health sciences, research problems become more complex, and relying solely on a quantitative or qualitative research approach is not sufficient. Scientific research has become increasingly interdisciplinary, requiring multidisciplinary approaches from research teams with experts having very different methodological interests and skills. All mentioned above suggest the use of a mixed approach, which some authors refer to as methodological pluralism or mixed studies [1, 2].

Qualitative and quantitative researches in medical and health sciences, as separate approaches, have become more developed and legitimate in their own right, which in a way gives them enough credibility for their "mixing," although mixed methods research remains extremely rare [2]. Qualitative and quantitative researches, as separate approaches, have become more developed and legitimate in their own right, which in a way gives them enough credibility for their integration [3]. The main challenges and problems with qualitative research are the issues of data credibility and consistency, the objectivity of conclusions, and the generalization of results. To address these challenges, credibility and consistency of data are used, as well as the possibility of generalizing the results of quantitative methods, along with the credibility and authenticity of qualitative methods [4]. An exploratory sequential design involves using the qualitative and then the quantitative research approach. It is used for the researcher to generalize the results of qualitative research when conducting the second, quantitative research. This approach is commonly used when developing and testing new measurement instruments [5]. The authors have assumed that the analysis of professional and scientific literature dealing with the Mixed Methods approach is scarce and that this approach is not prevalent in research in our region. To the best of our knowledge, this is the first study in Bosnia and Herzegovina that has examined the application of mixed studies in medical and health sciences. The aims of this study were to determine the progress of scientific literature regarding the prevalence of Mixed Methods studies in medical and health sciences, to identify the most relevant aspects of topics and relevant journals, and to determine the most productive authors and countries, as well as their "collaboration network".

Methods

This study focused on bibliometric analysis of scientific publications on the topic of mixed studies in medical and health sciences. The data source selected was the Dimensions database. The data were analyzed using the VosViewer program designed for bibliometric and visual data analyses.

Bibliometric and visual analyses were used to map the scientific literature in the research area. The Dimensions database was used for the search. The advantage of this methodology is its comprehensive evaluation of scientific literature [6]. To reduce researcher bias, a protocol for the analysis procedure was established [7]. After many attempts to search for different keyword combinations, the final search strategy followed the Boolean algorithm and included the following: "mixed studies" AND (health OR medical). Raw data were extracted from the Dimensions database in CSV format. The CSV file was processed in the Vos Viewer program. The search was conducted in September 2023, and a total of 485 scientific publications were found. Scientific publications with keywords in the title or abstract in all research categories were included. The study encompassed all citation databases, including only scientific articles and all research categories.

The choice of time intervals in the research was made to better understand the dynamics of the development of scientific literature on mixed studies in medical and health sciences. The selection of these specific time intervals is justified for several key reasons:

1. Initial period (2014–2019): This period encompasses the beginning of research on mixed studies in medical and health sciences. Researchers decided to include this period to examine how this field began, how early the interest existed, and how it evolved in its early stages.

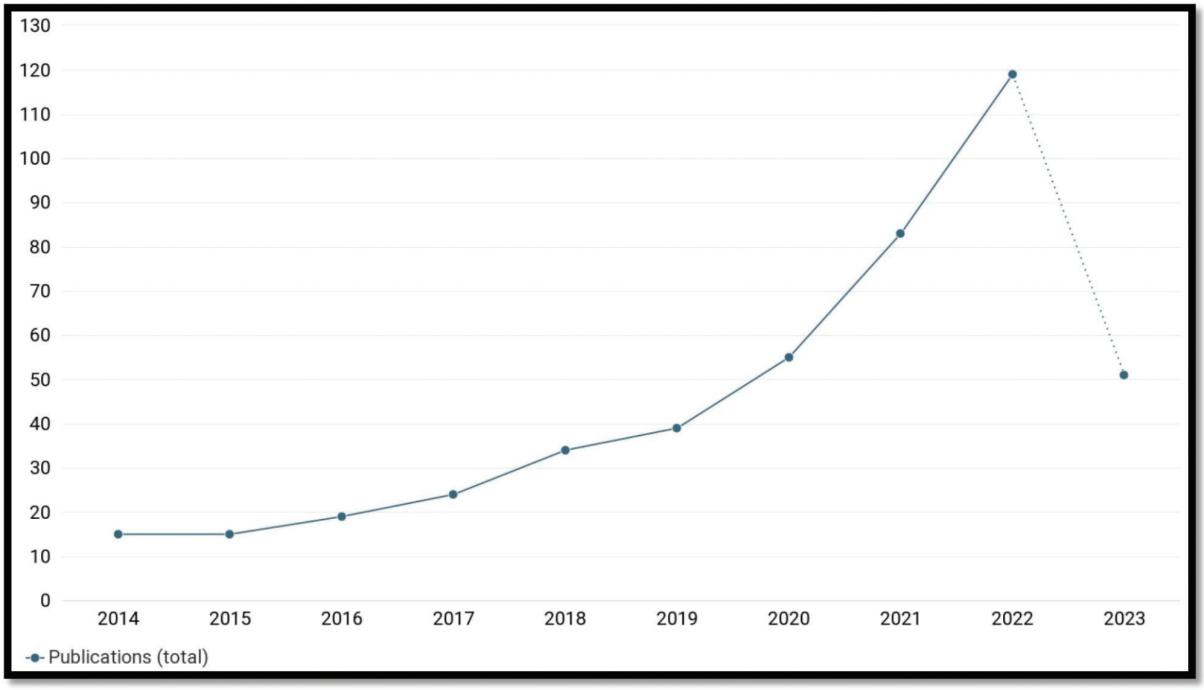
2. Middle period (2019–2022): This period is significant as it shows a dramatic increase in the number of publications on the topic of

mixed studies. This indicates rapid growth and a sharp rise in researchers' interest in this area. Additionally, the COVID-19 pandemic led to substantial interest and rapid research development in this field, which could explain the sudden surge in publications during this period. This period was chosen to highlight the momentous development and increased research activity.

3. Current period (2022–): By including the current period, researchers aimed to monitor the ongoing development of this field. However, they also observed a significant decline in the number of studies during 2023. These time intervals together provide a more comprehensive picture of the evolution of research on mixed studies in medical and health sciences, allowing for the analysis of the initial phases, rapid growth, and potential shifts in interest.

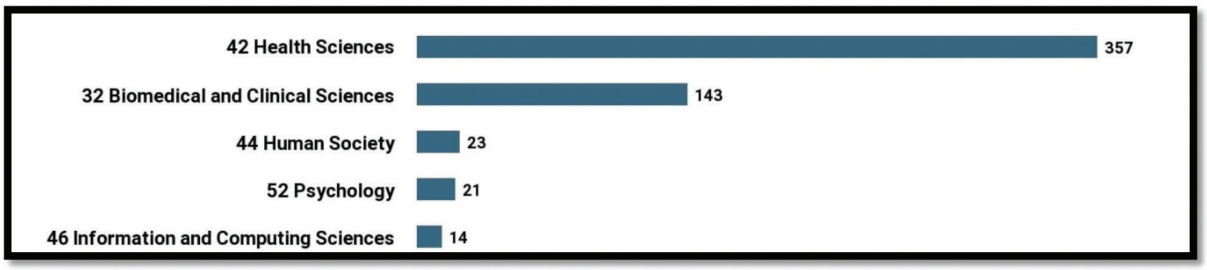
Results

Graph 1 shows the evolution of scientific production on this topic. This evolution had three clearly defined periods, the first from 2014 to 2019 when the number of publications was very low, the second from 2019 to 2022 when scientific production grew exponentially, reaching its peak in 2022 (120 publications). Then, there is an exponential decline in 2023 because the number of studies is much smaller than in the previous period (a total of 50 relevant studies).



Graph 1. Dynamics of scientific production in mixed studies within medical and health sciences: Analysis of the temporal evolution of publication counts, exploring three key periods in the development of this research

On graph 2, we see research categories that have more than 10 published articles in this field. As we can see, the analyzed articles are mostly from the fields of medical and health sciences, biomedical and clinical sciences, humanities and psychology, as well as computer science. Therefore, we notice that health sciences had the highest number of mixed studies (n=357), while computer science (n=14) used mixed studies the least.



Graph 2. Representation of research categories in analyzed articles on mixed studies

The most relevant journals in this field are shown in table 1. The journal with the most documents (n=21) and the most citations (n=864) was BMJ Open. Following that, the most relevant journals in terms of documents and citations were PlosOne, Systematic Reviews, Journal of Advanced Nursing, and International Journal of Nursing Studies.

Table 1. The most relevant journals for publishing mixed studies in medical and health sciences

Journals	Number of documents	Number of citations
BMJ open	21	864
PlosOne	16	451
Systematic reviews	9	85
Journal of advanced nursing	9	132
International journal of nursing studies	8	864

To determine potential partnerships between journals, co-citation analysis was conducted. This method is used to determine the similarity between two documents. Two articles are considered co-cited when both appear in the references of the third document. If documents A and B are cited in paper C, they can be considered connected, even if they are not directly cited. The more articles cite both A and B together, the stronger is their connection. The co-citation frequency is defined as the frequency at which two articles are cited together. The minimum number of citations per journal was set at 50, resulting in the inclusion of 37 articles. Clusters can be identified in figure 1. Clusters closer to each other indicate close connections. As we can see in figure 1, there are four major clusters. The interpretation of the map is simple. The left side of the map contains the yellow cluster related to psycho-oncology, palliative medicine, while the clusters on the right side (red, blue, green) are related to pediatrics, patient education, and nursing research. We can clearly see the relationship between all clusters, meaning that all areas using this combined method are closely and firmly connected.

Table 2 shows the three most cited articles. The most cited article is "The Annual

Review of Public Health" from 2014, with a total of 841 citations. Then, in terms of citation numbers, the journals "The International Journal of Nursing Studies" and "International Journal of Medical Informatics" are also prominent.

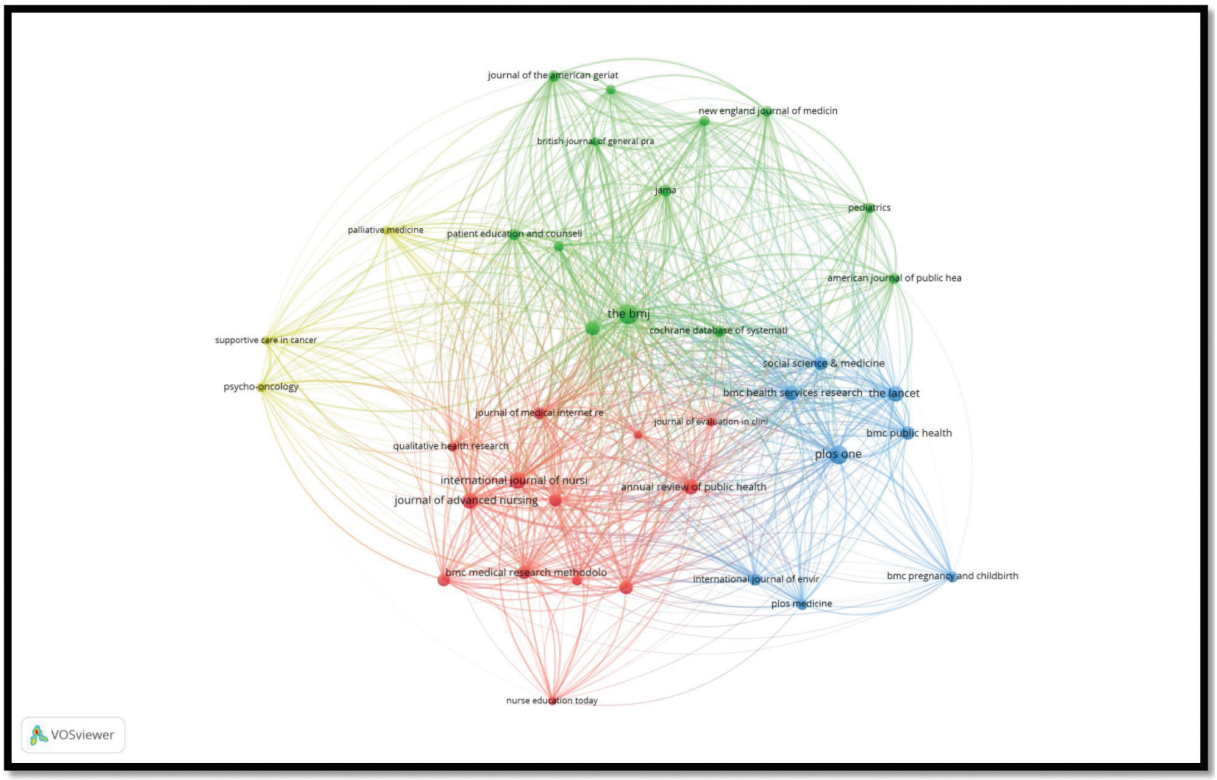


Figure 1. Map of co-citation of journals illustrating the interconnectedness and proximity of journals in the field of mixed studies in medical and health sciences

Table 2. The most cited articles in the unit of analysis

Pluye P, Hong QN. Combining the power of stories and the power of numbers: mixed methods research and mixed studies reviews. Annu Rev Public Health 2014;35:29–45.	841
Pluye P, Gagnon MP, Griffiths F, Johnson-Lafleur J. A scoring system for appraising mixed methods research, and concomitantly appraising qualitative, quantitative and mixed methods primary studies in Mixed Studies Reviews. Int J Nurs Stud 2009;46(4):529–46.	733
Peek ST, Wouters EJ, van Hoof J, Luijkx KG, Boeije HR, Vrijhoef HJ. Factors influencing acceptance of technology for aging in place: a systematic review. Int J Med Inform 2014;83(4):235–48.	713

Figure 2 shows a map of bibliographic connectivity between countries (based on the criteria of a minimum of five documents per country and a minimum of 100 citations). The map reveals two larger (green and red) and two smaller (blue and yellow) clusters. The most prominent node in the red cluster is the USA, indicating that articles from the USA are

most frequently found in the bibliographies of articles from other countries in the red cluster (Sweden, Ethiopia, Singapore, etc.). In the green cluster, the most prominent nodes represent Colombia and France, meaning that the bibliographies of articles from other countries in the green cluster most frequently cite articles produced in these countries (Colombia and France). The blue cluster is small and includes three countries: the United Kingdom, Canada, and Australia, as the most prominent and closely connected countries. The yellow cluster consists of Portugal and Brazil.

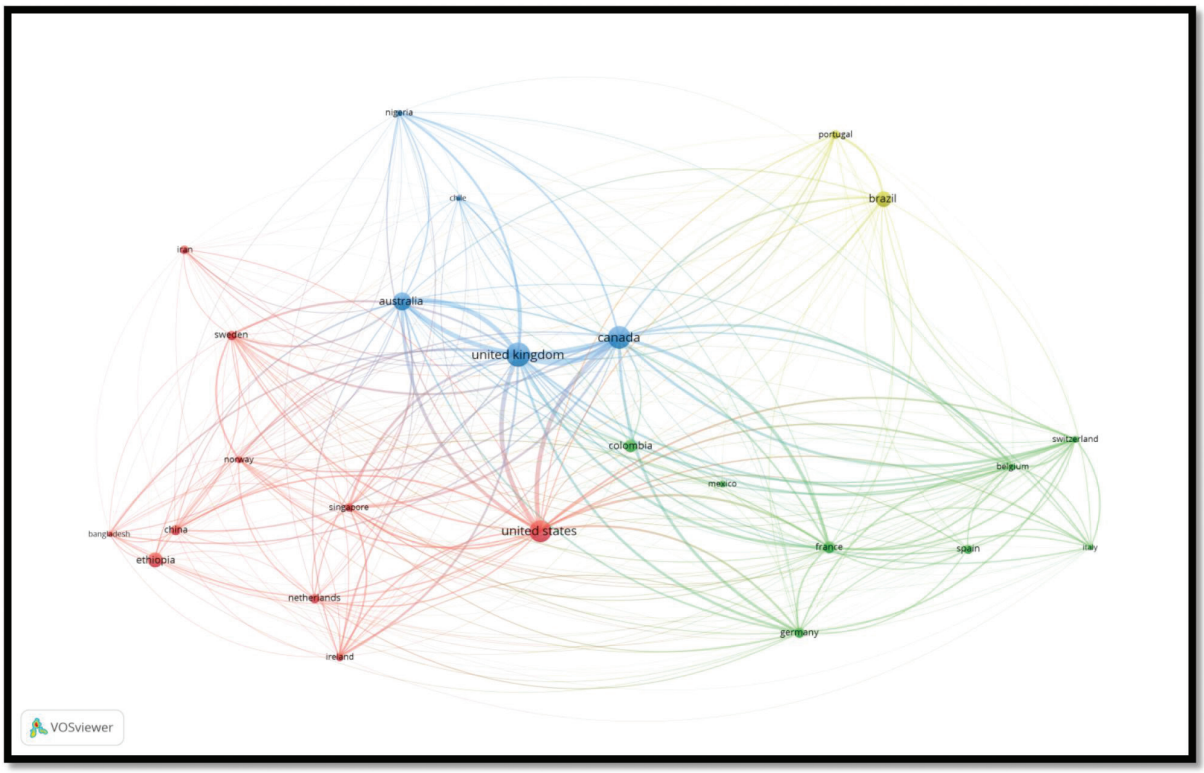


Figure 2. Map of bibliographic connectivity among countries in the field of mixed studies in medical and health sciences

Figure 3 displays a word co-occurrence network. We observe two separate clusters (red and green). Larger nodes indicate more frequent word occurrences. Wider lines between nodes indicate stronger connections and closer relationships between topics. It is evident that there are words related to mixed studies, problems, factors, communities, and certain databases (Medline, database, literature review).

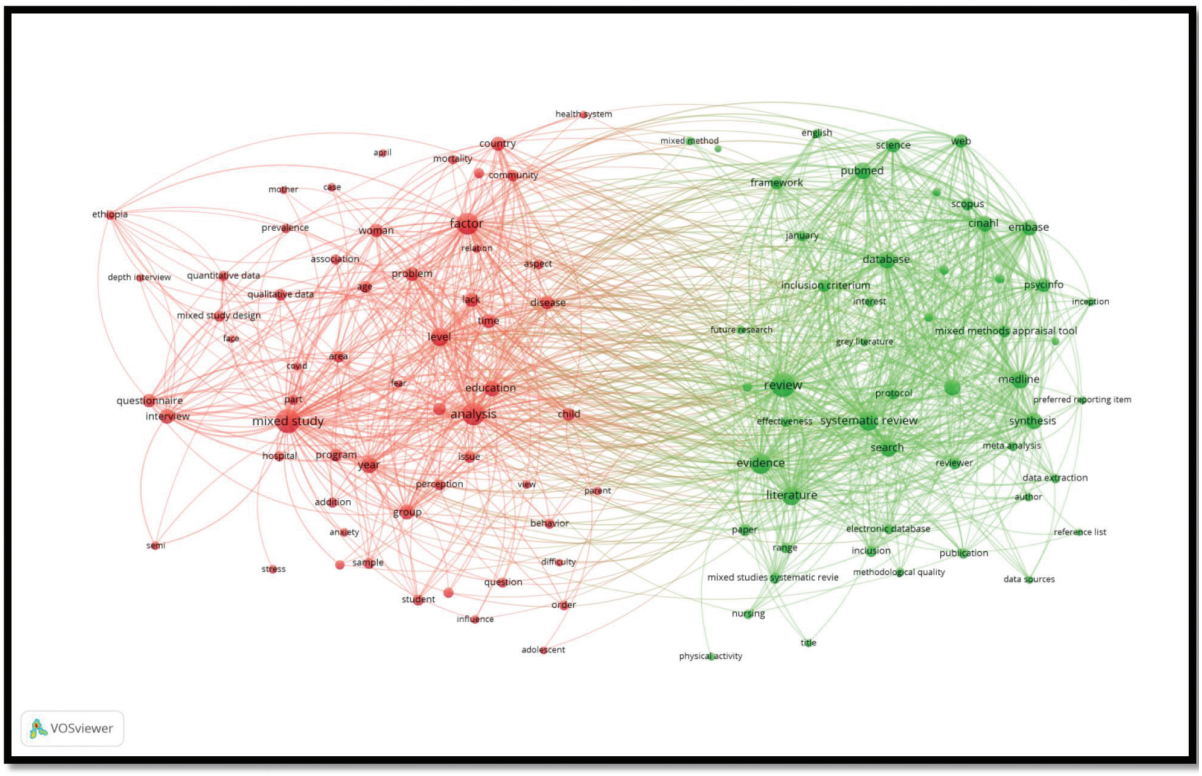


Figure 3. Most prevalent keywords in mixed studies in medical and health sciences

Discussion

The examination of the prevalence of mixed methods studies in medical and health sciences included productivity, trends, journals, and authors, as well as commonly addressed topics.

In the field of medical and health sciences, numerous issues often arising from complex phenomena impose the increasing application of mixed scientific research – combining quantitative and qualitative methods [8, 9]. However, from our analysis, we observe a noticeable decline in the use of such studies in the last year, which aligns with the research dynamics in this area. Specifically, it was found that the application of mixed studies in this field exponentially increased from 2014, followed by a drastic decline.

Relevant studies [10, 11] have dealt with the combination of quantitative and qualitative methods. These authors concluded that these methods could be combined for complementary purposes. In their study, they developed four models for integrating qualitative and quantitative methods in healthcare research. Qualitative and quantitatively obtained results have numerous advantages. The qualitative method contributes to the development of quantitative research instruments (e.g., focus groups are effective for questionnaire development, and qualitative data serve better interpretation and understanding of quantitative data) [11]. The most productive research categories on this topic are health sciences, psychology, and computer sciences, which is expected because, according to the WHO (2015), there are 360 million people worldwide with various health issues [12].

Among the various sources that share knowledge in these fields, the most productive is the American Annals of Public Health, with the highest number of publications and the highest number of citations, which is not surprising considering that the country with the most published articles is the USA. The USA is also at the center of the bibliographic coupling map, with close connections to Sweden, Ethiopia, Colombia, and Singapore.

The mixed methodological approach is sometimes referred to as multimethod research or methodological pluralism, which involves the combination of more than one method, as well as the combination of data, paradigms, approaches, and perspectives in the research process [13, 14, 15]. When it comes to the map of co-occurrence, we see keywords related to mixed studies, problems, factors, communities.

One could argue that the application of mixed methods studies ultimately relies on pragmatic foundations with theoretical shortcomings, which carries the risk of losing flexibility and openness during the research process. However, the use of the inductive-constructivist approach leads to the accumulation of various processes, which may raise questions about the validity of the obtained results, aligning mixed studies in methodology with the triangulation process [16, 17].

Conclusion

This research underscores the importance of understanding current trends and advancements in the application of mixed studies in medical and health sciences. Although the results indicate the decreased interest in this topic in the last year, it does not diminish the significance of this research. On the contrary, it provides valuable insights for researchers into key authors, journals, and countries that have been most active in this field. Progress in medical and health sciences demands the comprehensive approach to research, incorporating both quantitative and qualitative methods, such as mixed studies. Understanding current trends and the resources available to researchers assists in achieving better outcomes and improving the quality of healthcare practice. Our study can serve as a foundation for future research and contribution to further advancements in this field. Our analysis has numerous implications, particularly in providing useful insights for future researchers in identifying relevant and interesting research topics in this field, thus enabling the exploration of various scientific subjects. Limitations of our study relate to the restriction of searching in a single database, Dimensions. A recommendation for further research could involve expanding the analysis to other databases such as Web of Science, Scopus, and PubMed.

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Ethical approval. The Ethics Committee of the University East Sarajevo, Faculty of Medicine Foča, Republic of Srpska, Bosnia and Herzegovina, approved the study and informed consent was obtained from all individual respondents. The research was conducted according to the Declaration of Helsinki.

Conflicts of interest. The authors declare no conflict of interest.

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Metodološki pluralizam ili multimetodsko istraživanje u zdravstvenim i medicinskim naukama

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Uvod. Razvojem medicinskih i zdravstvenih nauka istraživački problemi postaju složeniji, pri čemu oslanjanje samo na kvantitativni ili kvalitativni istraživački pristup nije dovoljan. Cilj ovog istraživanja bio je da se predstavi napredak i trendovi naučne literature u oblasti primjene kombinovanih studija u medicinskim i zdravstvenim naukama.

Metode. Korišćena je bibliometrijska analiza kako bi se utvrdili postavljeni ciljevi. Za analizu literature izabrana je baza podataka Dimensions. Jedinica analize se sastojala od 485 publikacija i primijenjen je program VosViewer.

Rezultati. Rezultati su pokazali da je ova tema u nauci doživjela eksponencijalni pad posljednjih godinu dana. Takođe, identifikovani su najproduktivniji autori, časopisi i zemlje, kao i njihova mreža saradnje kroz vizuelnu analizu kocitiranja. Na osnovu analize riječi koje se ponavljaju možemo da zaključimo da su riječi: kombinovane studije, problem, faktori, zajednica riječi koje se najčešće ponavljaju, što bi značilo da su teme koje su obrađivane u ovom domenu uglavnom fokusirane na ispitivanje i rješavanje brojnih problema iz oblasti medicinskih i zdravstvenih nauka.

Zaključak. Iako se iz rezultata vidi da je interesovanje za ovu temu opalo u posljednjoj godini, to ne umanjuje značaj ovog istraživanja. Napredak u medicinskim i zdravstvenim naukama zahtijeva sveobuhvatan pristup istraživanju, koji uključuje i kvantitativne i kvalitativne metode, kao što su kombinovane studije. Razumijevanje trenutnih tendencija i resursa, koji su na raspolaganju istraživačima, pomaže u postizanju boljih rezultata i unapređenju kvaliteta zdravstvene prakse.

Ključne riječi: kombinovane studije, medicinske nauke, zdravstvene nauke, VosViewer