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Review article

Research hotspots and trends in healthcare workers' resilience: A bibliometric and visualized analysis

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ABSTRACT

Background: The resilience of healthcare workers has gained increasing attention, yet comprehensive studies focusing on recent trends and developments are scarce. We conducted an extensive bibliometric analysis from inception to 2023 to address this gap.
Methods: Publications on healthcare workers' resilience were extracted from the Web of Science Core Collection database. Bibliometric analysis was conducted with CiteSpace, VOSviewer, and Scimago Graphica, focusing on annual publications, country/region, institution, journal, author, keyword analysis, and reference co-citation analysis related to resilience in healthcare workers.
Results: The analysis included 750 documents, revealing a general upward trend in publications across 67 countries/regions, 1,251 institutions, and 3,166 authors. The USA and China emerged as the top contributors, with 192 and 168 publications, respectively. Based on keyword analysis and reference co-citation analysis, the focus areas include the Resilience Scale, the impact of the COVID-19 pandemic on HCWs and their resilience, and nurse resilience.
Conclusion: This study highlights the growing interest in healthcare workers' resilience by using bibliometric and visualization techniques for effective analysis. This paper will enhance scholars' understanding of the dynamic evolution of healthcare workers' resilience and identify emerging research topics.

1. Introduction

Healthcare workers (HCWs) are consistently exposed to various stressors in their professional lives. These stressors, including work overload, demanding patients, exposure to disease, workplace violence, and high social expectations for health professionals, create a challenging work environment [1–6]. Chronic exposure to these stressors adversely affects mental health, leading to burnout and diminished job satisfaction [7–13]. For example, within the United Kingdom's National Health Service (NHS), almost 50 % of the

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workforce reported experiencing discomfort from work-related stress [14]. Likewise, a survey in China revealed significant physical and psychological distress among HCWs, particularly nurses, who showed the highest rates of anxiety and depression [15,16].

Resilience, the ability to maintain stability and adapt effectively in the face of stress and adversity, plays a crucial role in HCWs' mental health [17–20]. It promotes perseverance through various challenges and is positively associated with higher job satisfaction, reduced staff turnover, enhanced mental health, and improved patient satisfaction [21]. Developing resilience is particularly important among HCWs who frequently encounter traumatic events, accidents, emergencies, and epidemic outbreaks [22]. Several strategies are available to HCWs to bolster their resilience. These include lifestyle approaches such as maintaining a balanced diet, regular exercise, and ensuring adequate sleep [23]. Psychological strategies like mindfulness and cultivating a compassionate mindset effectively strengthen personal resilience, enhancing stress management ability [24,25].

The COVID-19 pandemic has intensified the focus on the resilience of HCWs, leading to a surge in related research, including intervention studies and systematic reviews [17,26–29]. However, bibliometric analyses in this area are limited.

Bibliometrics employs quantitative methods to analyze scientific literature, offering insights into a research area's development, evolution, and impact [30,31]. Previous bibliometric studies have primarily focused on psychological resilience among general populations and throughout the COVID-19 pandemic [32,33]. There is a notable gap in bibliometric research addressing HCWs' resilience. To address this, our study conducts a comprehensive bibliometric analysis of data from inception to 2023, aiming to delineate the field's developmental trajectory and guide future research.

2. Material and methods

2.1. Aims

The primary objectives of this study were.

(a) To determine the distribution and temporal trends of publications related to the psychological resilience of HCWs across various countries/regions, institutions, and journals.
(b) To identify and analyze the research hotspots on psychological resilience among HCWs.

2.2. Study design

This study employs a bibliometric analysis approach, focusing on literature about psychological resilience among HCWs. The analysis covers publications extracted from the Web of Science Core Collection database from inception to 2023.

2.3. Participants

This study did not involve human participants; all the data were obtained from the WOS database.

2.4. Data source and search strategy

This study utilized the Science Citation Index-Expanded (SCIE) and the Social Sciences Citation Index (SSCI) from the WoSCC to collect bibliographic data on HCWs' resilience. WoSCC is one of the most widely used and trusted global citation databases of science, extensively utilized by scholars for bibliometric analysis [34–36].

The search terms for our study focused on "HCWs" and "resilience". The retrieval strategy is as follows: (TI = "medical worker*" OR TI = "health* worker*" OR TI = "health care worker*" OR TI = doctor* OR TI = nurs* OR TI = "medical staff" OR TI = "nursing staff" OR TI = "physician*" OR TI = "surgeon*" OR TI = clinician* OR TI= "Health Personnel" or TI = "health* provider*" or TI= "health care provider*" or TI = "health practitioners" or TI = Anesthetists or TI = Pharmacists or TI= Therapists or TI = Radiologists or TI = "Medical Laboratory Personnel" or TI = "Traditional Medicine Practitioners" or TI = Allergists OR TI = Anesthesiologists OR TI = Cardiologists OR TI = Dermatologists OR TI = Endocrinologists OR TI =Gastroenterologists OR TI = "general practitioners" OR TI = Geriatricians OR TI = Gynecologists OR TI = Hospitalists OR TI = Nephrologists OR TI = Neurologists OR TI = Obstetricians OR TI = Oncologists OR TI = Ophthalmologists OR TI = Otolaryngologists OR TI = Pathologists OR TI = Pediatricians OR TI = Physiatrists OR TI = Pulmonologists OR TI = Radiologists OR TI = Rheumatologists OR TI = Urologists or TI = Dentists) and TI = resilien*.

The literature search covered the period from the databases' inception to 2023. This search yielded a total of 1,398 records, with 750 for the bibliometric analysis after excluding inappropriate and non-English articles. This process followed PRISMA guidelines to guarantee a structured and transparent methodology [37].

2.5. Data extraction

The screening process focused on selecting articles and reviews from English-language sources. This was followed by a thorough manual review of titles and abstracts, resulting in the removal of duplicates and records considered irrelevant to the study's goals. The retrieved data, encompassing the articles' content and cited references, was downloaded, exported, and documented in the 'Full Record and Cited References' format for subsequent analysis. The comprehensive search, screening, and analysis methodologies of the study were visually summarized in a PRISMA flow diagram (Fig. 1), offering a clear overview of the research process.

2.6. Data analysis

CiteSpace 5.5 software was used to analyze journals and keywords, forming burst keywords and dual-map overlay of journals. VOSviewer 1.6.1 software visually analyzed the countries' collaborative network and the keywords' co-occurrence network. Scimago Graphica 1.0.34 software was used to generate a world map, visually representing the global distribution of the documented research.

2.7. Validity, reliability, and rigor

Two independent researchers performed the literature retrieval and data analysis independently, with a third researcher making the final judgment in case of any disagreement. All analyses conducted in this study were based on quantitative data, enhancing the results' reliability. To ensure the rigor and thoroughness of the analysis, synonyms, and near-synonyms were carefully identified and merged.

3. Results

3.1. Analysis of annual publications and citations

The literature search resulted in 1,398 publications, of which 750 were chosen for further bibliometric analysis. As illustrated in Fig. 2, the first publication in this field was traced back to 2005. Between 2005 and 2014, the annual publication output consistently stayed under 10. Between 2015 and 2019, there was a slight and irregular increase in the number of related studies, with annual totals never exceeding 50. However, from 2020 onwards, there was a notable surge in research activity, characterized by a substantial increase in the volume of studies. The years 2020–2023 accounted for a remarkable 74.8 % of all studies included in this analysis, with 561 publications.

3.2. Country distribution and cooperation network analysis

Fig. 3 plots a world map of prolific countries, with 67 countries contributing to the field of resilience in HCWs. The USA, China, Australia, and England rank as leading contributors to research on HCWs' resilience. Table 1 ranks these countries by their number of publications. The USA and China are at the forefront with 192 and 168 publications respectively, together comprising 48.0 % of the total 750 publications. Australia follows with 94 papers, England with 65, and Turkey with 44. The USA leads in citation frequency, with a total of 5,470 citations.

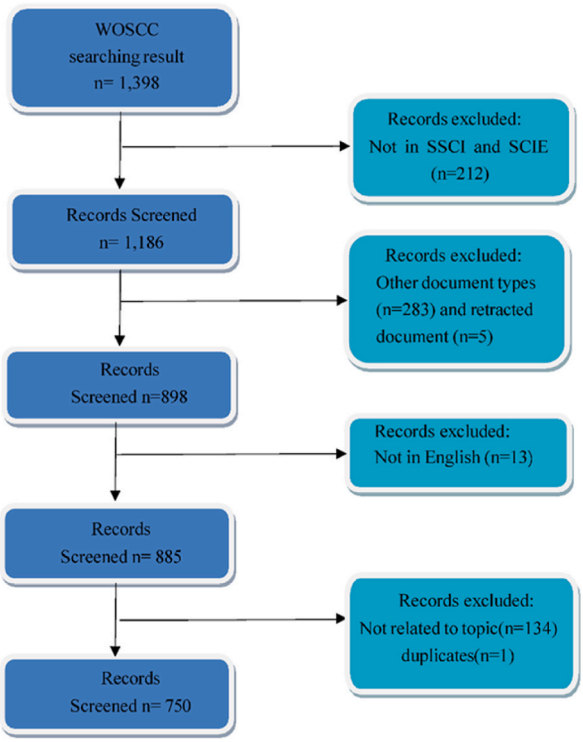

Fig. 1. Flow chart for including and excluding documents. Other document types include Early Access, Proceeding Paper, and Book Chapters.

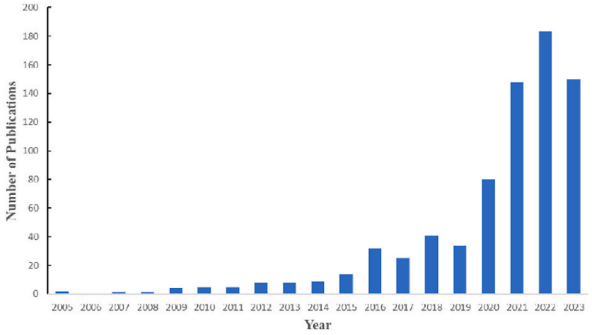

Fig. 2. Annual evolution of publications and citations output for HCWs' resilience.

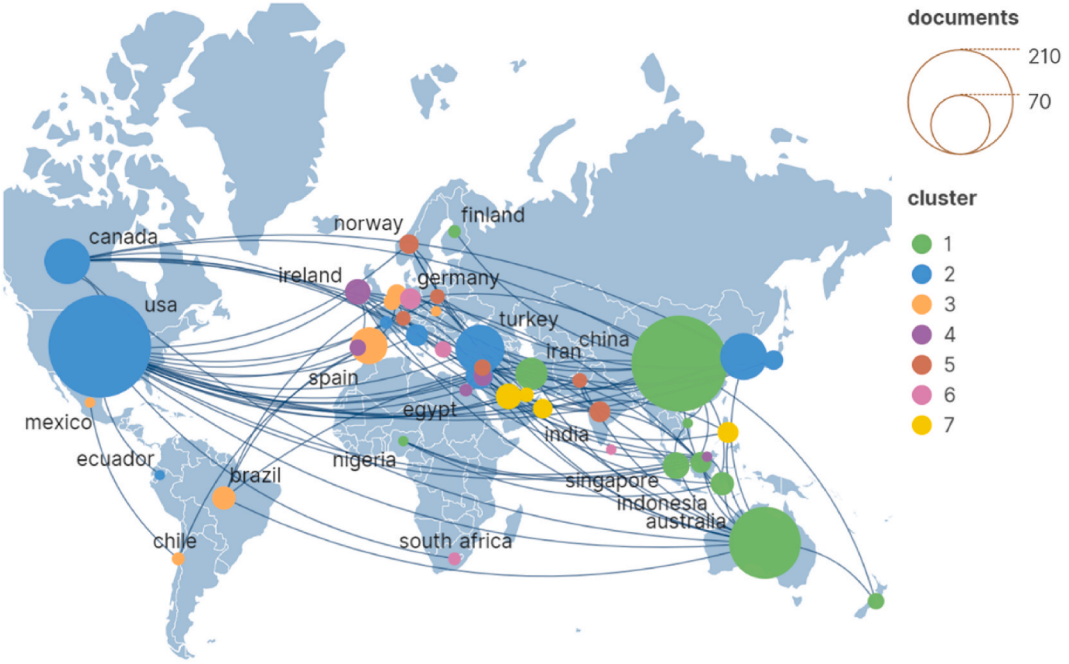

Fig. 3. Distribution of research on resilience in HCWs worldwide.

Table 1
Top 10 contributing countries and institutions to publications on HCWs' resilience.

Rank	Country	N	Citations	Institution	N	Citations
1	USA	192	5,470	Curtin University	17	707
2	China	168	2,371	Sichuan University	15	251
3	Australia	94	3,706	The University of Adelaide	12	384
4	England	65	1,716	Australian Catholic University	12	639
5	Turkey	44	454	Shandong University	12	277
6	South Korea	40	1337	Central Queensland University	10	151
7	Canada	38	853	Monash University	9	441
8	Spain	25	1007	University of Ottawa	9	147
9	Iran	19	241	Chang Gung University of Science and Technology	9	97
10	Israel	14	736	Duke University	9	243

The collaborative networks of countries are depicted in Fig. 4, with each node representing a country. The node's size indicates the volume of documents produced by that country, and the color signifies the cluster to which the country belongs. Notably, the USA, China, Australia, and England are at the core of this network, indicating close cooperation among these nations in this research area.

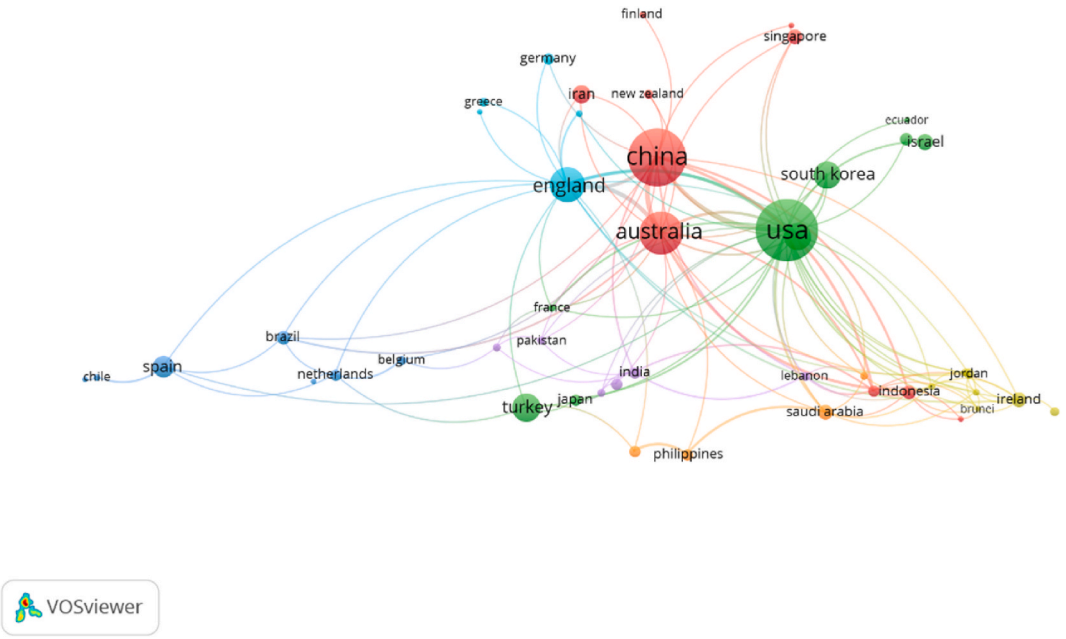

Fig. 4. International cooperation networks between countries. These countries are marked with varying colors, and the link represents the collaboration between the countries on HCWs' resilience.

3.3. Institutional distribution analysis

A total of 1,251 institutions engaged in studies on resilience among HCWs. Curtin University published 17 papers, leading the field, closely followed by Sichuan University with 15 publications. The University of Adelaide, Australian Catholic University, and Shandong University each contributed 10 papers (Table 1). In terms of citation counts, Sultan Qaboos University ranks highest with 928 citations, succeeded by Curtin University with 707, University of Technology Sydney with 655, and Australian Catholic University with 639.

3.4. Authors and co-cited authors cooperation network analysis

Altogether 3,166 authors were involved in studies on the resilience among HCWs. A notable majority, 3,142 authors (90.65 %), have contributed between one to four publications. In contrast, a significantly smaller group of only 4 authors (0.13 %) has contributed eight or more publications.

Table 2 lists the top 10 most productive and frequently co-cited authors of this research area. At the top of the prolific authors' list stands Foster Kim with 10 publications, succeeded by Hegney Desley and Jackson Debra, each with 9 publications. Regarding citations, Connor KM leads with 253, followed by Mealer M with 167, highlighting their significant contributions to research advancement in this field.

3.5. Journals and co-cited journals network analysis

Table 3 lists the top 10 journals with the highest publication output and those that were most frequently co-cited in this research

Table 2
The top 10 most prolific and co-cited authors in resilience research among HCWs.

Rank	Author	N	Co-cited author	Citations
1	Foster Kim	10	Connor KM	253
2	Hegney Desley	9	Mealer M	167
3	Jackson Debra	9	Labrague LJ	148
4	Rees Clare S.	8	Maslach C	144
5	Lopez Violeta	7	Shanafelt TD	127
6	Craigie Mark	6	Jackson D	120
7	Su Yonggang	6	Gillespie BM	107
8	Brown Janie A.	6	Campbell-sills L	107
9	Labrague Leodoro J	6	Foster K	105
10	Chen Chaoran	5	Hart PL	96

area. Leading the list is the *Journal of Nursing Management* (42 publications), followed by the *International Journal of Environmental Research and Public Health* (32 publications) and the *International Journal of Mental Health Nursing* (25 publications). Among the leading journals, four are located in England, three in Switzerland, and one each in Australia, the USA, and Scotland. I *International Journal of Mental Health Nursing* from Australia stands out for having the highest impact factor. In terms of citations, the *Journal of Advanced Nursing* leads with a total of 833 citations, followed by the *Journal of Nursing Management* with 806 citations, and *Nurse Education Today* with 804 citations.

Fig. 5 shows the dual-map overlay visualization that offers a unique perspective on the interplay between citing and cited journals in HCWs' resilience. The left side displays journals that cite works in this field (citing journals), whereas the right side indicates those cited (cited journals). Labels on the map indicate the subject areas covered by these publications. The visualization is particularly illuminating regarding the citation pathways, represented by colored curves. The curves on the map delineate the path of references, leading from the citing documents on the left to the cited papers on the right.

Notably, four primary citation pathways emerge in the analysis: from '*Medicine, medical, clinical*' to '*Health, Nursing, Medicine*' and '*Psychology, Education, Health*'; from '*Psychology, Education, and Health*' to '*Health, Nursing, and Medicine*' and '*Psychology, Education, Social*'. These citation trends indicate that the current research on HCWs' resilience mainly focuses on '*Medicine, medical, clinical*' and '*Psychology, Education, Health*'. Furthermore, the most frequently cited papers in this domain are predominantly published in journals categorized under '*Health, Nursing, Medicine*' and '*Psychology, Education, Social*'.

3.6. Keyword co-occurrence analysis

In this research, we conducted a clustering analysis of keyword co-occurrences using VOSviewer, identifying 1,758 unique terms, 81 of which appeared more than ten times. Fig. 6a illustrates this analysis, revealing distinct clusters represented by various colors on the map, each denoting a thematic focus within the research landscape.

The primary cluster, highlighted in red, revolves around COVID-19-related terms, focusing on its effects on mental health, anxiety, depression, and the importance of resilience throughout the pandemic, underscoring its dominance in the field. The second cluster, shown in green, centers on resilience and stress among nurses and nursing students. The third cluster, colored blue, comprises terms associated with burnout, job satisfaction, mindfulness, and quality of life. Additionally, two more clusters, in yellow and purple, feature terms concerning predictors, turnover intentions, posttraumatic growth, and leadership, enhancing the field's thematic diversity.

The keywords 'resilience', 'nurses', 'burnout syndrome', 'stress', and 'COVID-19′ stand out as the most frequently occurring. Fig. 6b depicts the chronological development of these keywords, with purple indicating earlier emergence and yellow highlighting more recent entries. This temporal analysis showcases the shifting focus of research, with recent emphasis on 'COVID-19′, 'leadership', 'resilience scale', 'social support', 'work engagement', 'quality of life', and 'turnover intention' as the latest points of interest in this evolving area of study.

3.7. Analysis of co-cited references

The top 10 most cited literature on resilience among HCWs are shown in Table 4, with an average of 93 citations. The most cited article, appearing in Depression and Anxiety, introduces the Connor-Davidson Resilience Scale (CD-RISC). This instrument, designed to assess resilience, is noted for its robust psychometric properties [38]. The second-ranked paper reviews how personal resilience can be a strategic response to workplace adversity for nurses, highlighting the importance of their active engagement in developing resilience to enhance healthcare environments [39].

Fig. 7 presents the top 38 references with the highest citation bursts. The figure uses a blue line to represent the observation period

Table 3
The top 10 most productive journals and co-cited journals in research on HCWs' resilience.

Rank	Journals	Country	N	IF (2022)<	Co-cited journals	Co-citation	Country	IF (2022)<
1	Journal of Nursing Management	England	42	5.5	Journal of Advanced Nursing	833	England	3.8
2	International Journal of Environmental Research and Public Health	Switzerland	32	–	Journal of Nursing Management	806	England	5.5
3	International Journal of Mental Health Nursing	Australia	25	5.6	Nurse Education Today	804	Scotland	3.9
4	Frontiers in Psychology	Switzerland	25	3.8	International Journal of Nursing Studies	561	England	8.1
5	Nurse Education in Practice	England	23	3.2	Environmental Research and Public Health	479	Switzerland	–
6	Nurse Education Today	Scotland	22	3.9	International Journal of Mental Health Nursing	483	Australia	5.6
7	Journal of Advanced Nursing	England	22	3.8	Frontiers in Psychology	424	Switzerland	3.8
8	BMC Nursing	England	18	3.2	Journal of Clinical Nursing	391	England	4.2
9	Journal of Nursing Administration	USA	16	2.0	Plos One	320	USA	3.7
10	Frontiers in Psychiatry	Switzerland	15	4.7	Depression and Anxiety	275	USA	7.4

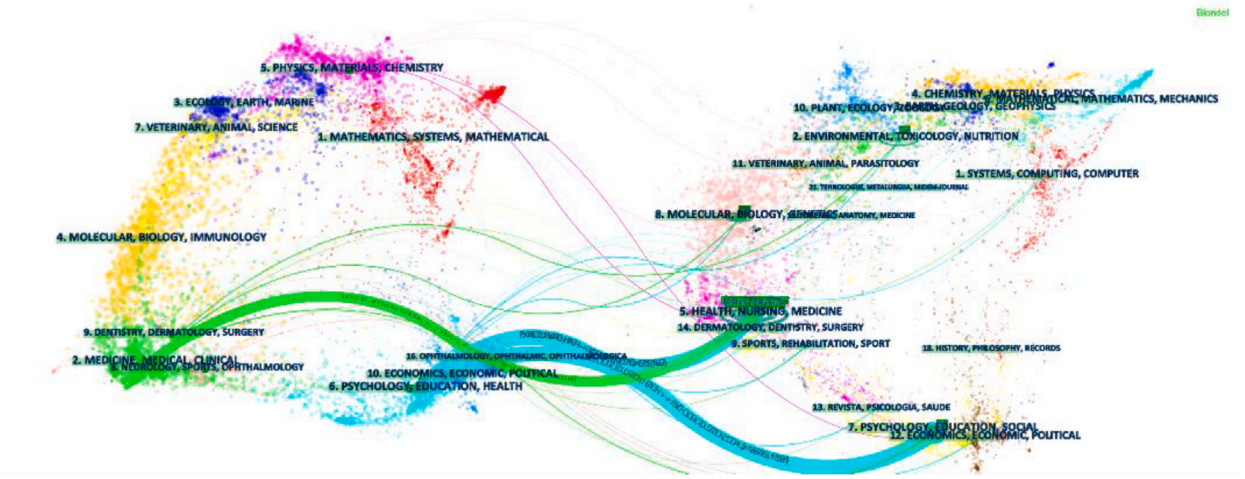

Fig. 5. The dual-map overlay of journals concerning HCWs' resilience. The citing and cited journals maps were located on the left and right sides, respectively. The labels denote the subjects that the publication covers. The colored curves illustrate the route of the references, starting from the left and ending on the right.

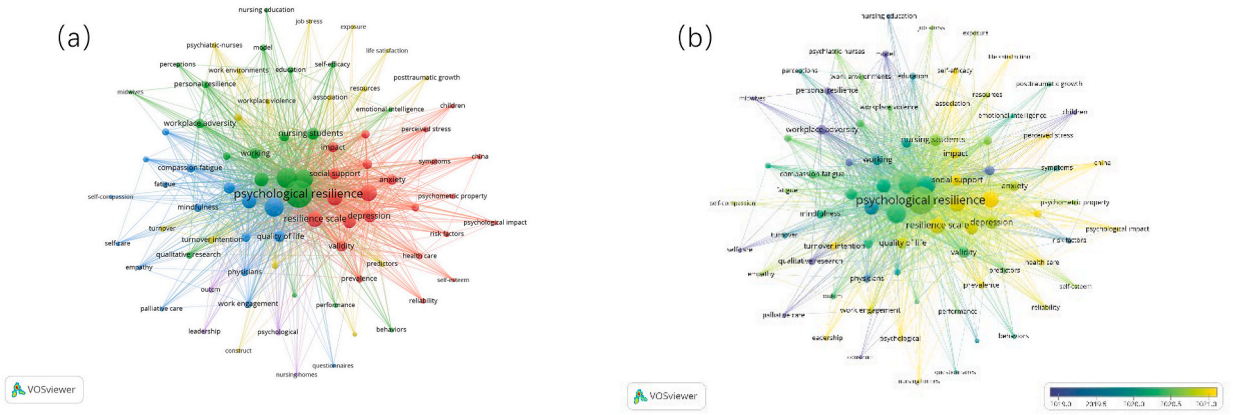

Fig. 6. (a) Co-occurrence visualization map of keywords; (b) Co-occurrence overlay map of keywords over time.

from 2005 to 2023, while a red line indicates a burst period, a phase of at least five years where the citations significantly increased. The first citation burst began with Jackson D's 2007 article in the *Journal of Advanced Nursing*, 'Personal resilience as a strategy for surviving and thriving in workplace adversity: a literature review,' recording a burst strength of 4.65 [39]. Mealer M's 'Resilience in nurses: an integrative review, ' published in the *Journal of Nursing Management*, experienced the most notable citation burst, attracting significant academic attention from 2016 to 2019, marked by a burst strength of 12.77 [40].

4. Discussion

4.1. General information

With research rapidly expanding across disciplines, scholars need to stay updated with the latest advancements in their specializations, particularly in the big data era. Beyond solely depending on meta-analyses and systematic reviews, bibliometric analysis now serves as an effective visualization tool for validating and reviewing existing literature. This study provides a comprehensive review of research on HCWs' resilience, based on the WoSCC database from inception to 2023, aiming to guide future research.

Historically, there has been a notable growth in the volume of published articles, which can be divided into three distinct periods. The first phase, from 2005 to 2014, witnessed a relatively low annual output of publications, likely due to minimal focus on this topic within the target group and limited funding availability. The following phase, from 2015 to 2019, experienced a modest yet fluctuating increase in research activity, reflecting escalating scholarly engagement. Commencing in 2020, there has been a significant surge in studies focused on the HCWs' resilience, a trend likely spurred by the COVID-19 pandemic's emphasis on the critical role of resilience among medical and emergency staff.

Table 4
Top 10 co-cited references that related to HCWs' resilience.

Rank	Title	First author	Source	IF (2022)	Year	Co-citation
	Development of a new resilience scale: the Connor-Davidson Resilience Scale (CD-RISC)	Connor KM	Depression and Anxiety	7.4	2003	236
2	Personal resilience as a strategy for surviving and thriving in the face of workplace adversity: a literature review	Jackson D	Journal of Advanced Nursing	3.8	2007	102
3	Resilience in nurses: an integrative review	Hart PL	Journal of Nursing Management	5.5	2014	96
4	Psychometric analysis and refinement of the Connor–Davidson Resilience Scale (CD-RISC): Validation of a 10-item measure of resilience	Campbell-sills L	Journal of Traumatic Stress	3.3	2007	81
5	The brief resilience scale: assessing the ability to bounce back	Smith BW	International Journal of Behavioral Medicine	2.7	2008	80
6	Factors associated with mental health outcomes among healthcare workers exposed to coronavirus disease 2019	Lai JB	JAMA Network Open	13.8	2020	74
7	Personal and work-related factors associated with nurse resilience: A systematic review	Yu F	International Journal of Nursing Studies	8.1	2019	70
8	The presence of resilience is associated with a healthier psychological profile in intensive care unit (ICU) nurses: results of a national survey	Mealer M	International Journal of Nursing Studies	8.1	2012	66
9	Burnout and Resilience Among Nurses Practicing in High-Intensity Settings	Rushton CH	American Journal of Critical Care	2.7	2015	66
10	The importance of teaching and learning resilience in the health disciplines: a critical review of the literature	Mcallister M	Nurse Education Today	3.9	2009	59

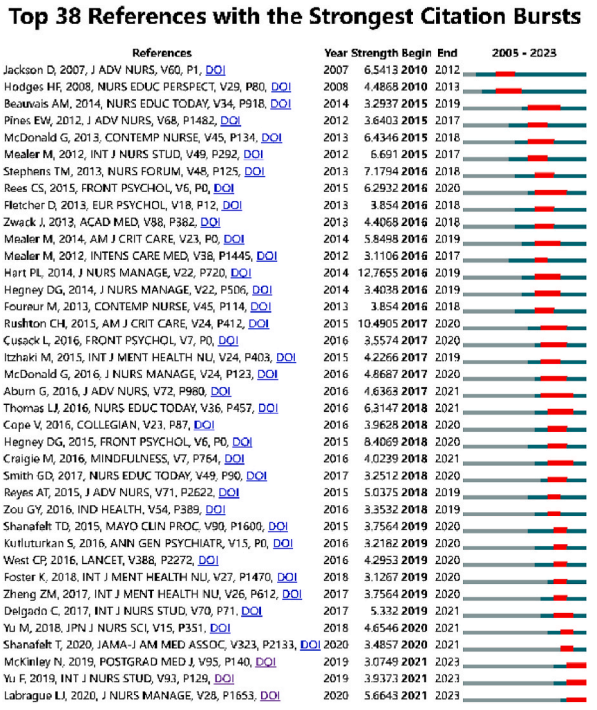

Fig. 7. Top 38 references with the strongest citation bursts. The red bar represents that the reference is frequently cited; the green bar denotes that the reference is infrequently cited.

Based on regional distribution, the USA and China are the leading countries with notable contributions to the field of resilience among HCWs. Analysis of the top 10 contributing institutions reveals that the majority are based in Australia and China. The collaborative networks of countries indicated that the USA, China, Australia, and England play central roles in this collaborative network. In particular, China demonstrates the broadest range of international connections. However, broadening engagement from diverse global entities is essential for deepening and enhancing the effectiveness of robust collaborations.

Kim Foster, Desley Hegney, Debra Jackson, Clare S. Rees, and Violeta Lopez are pivotal researchers in the domain of HCWs' resilience and have played foundational roles in the development of this field. Researchers from prominent Chinese institutions such as Sichuan University and Shandong University have made substantial contributions to this area. Scholars at Curtin University, The

University of Adelaide, and Australian Catholic University have also been crucial in advancing our understanding of HCWs' resilience. Connor KM and Mealer M stand out with over 160 co-citations, underscoring their significant influence in the research community.

4.2. Hotspots and frontiers

Drawing on keyword and reference co-citation analyses, we identified key research areas in HCWs' resilience. The focus areas include the Resilience Scale, the impact of the COVID-19 pandemic on HCWs, and their resilience and nurse resilience.

4.2.1. Resilience scales for HCWs

Wagnild and Young developed the Resilience Scale (RS-25), a 25-item, 7-point Likert scale, to assess resilience [41]. Despite its widespread use, the factor structure of RS-25 is still debated [42]. The brief RS-14 version presents a succinct and accessible alternative, with psychometric properties comparable to RS-25 [43]. The study by Zhao and colleagues on the RS-14's psychometric attributes among 7,231 Chinese nurses affirmed its validity and reliability within the Chinese context [44]. However, these scales may not fully capture the unique challenges faced by healthcare professionals.

To address this gap, Rahman et al. [45] introduced the Medical Professionals Resilience Scale (MeRS) in 2021, with 37 items tailored to the HCWs' resilience needs. The MeRS exhibited robust psychometric properties, suggesting its efficacy in assessing resilience among medical professionals. The scale's content, response mechanism, and structural validity enhance its applicability [45]. Nonetheless, broader adoption of the MeRS necessitates further validation across diverse healthcare environments to confirm its efficacy and reliability in various medical disciplines.

4.2.2. The impact of the COVID-19 pandemic on HCWs and their resilience

The COVID-19 pandemic, with its global reach and unprecedented challenges, has exerted pressure on healthcare systems and their personnel. Healthcare professionals, particularly those on the frontlines, have faced significant challenges, including increased workloads, scarcities of resources, and the emotional burden associated with high rates of patient illness and death [46,47]. These pressures have led to heightened psychological stress, secondary trauma, and burnout among HCWs, as evidenced by extensive research [48–50].

Resilience, the ability to adapt and thrive amidst adversity, has proven to be a critical buffer against these adverse effects. Research conducted by Emirza et al. on 160 HCWs in a Turkish public hospital indicates that resilience plays a significant role in improving mental well-being and reducing health-related anxiety through positive reinterpretation of challenges [51]. Similarly, Franck and colleagues' study on Belgian HCWs during the pandemic highlights the protective role of resilience in buffering against the psychological strains of the crisis [52].

Moreover, the pandemic's long-term impact on the mental health of HCWs underscores the need for healthcare systems to implement systemic changes, such as ongoing psychological support and resilience training, to better prepare for future crises. Such initiatives not only support the immediate well-being of HCWs but also contribute to the sustainability and effectiveness of healthcare delivery in challenging times.

4.2.3. Resilience among nurses

Nurse resilience, essential in the high-pressure healthcare environment, has drawn more attention due to prevalent stress and burnout within the profession. Yu et al. highlighted the detrimental effects of job demands—including stress, burnout, posttraumatic stress disorder, and workplace bullying—on resilience. Conversely, positive job resources like coping mechanisms, self-efficacy, social support, and job satisfaction have been shown to bolster resilience [53]. By conducting a meta-synthesis of 16 qualitative studies, Kim and Chang offered profound insights into the multifaceted nature of resilience from nurses' perspectives and experiences [54]. Further research has established a correlation between resilience and pivotal outcomes, including work performance, burnout levels, quality of life, and job satisfaction among nurses [55–59]. Kunzler and colleagues identified effective interventions for enhancing resilience in nursing staff, including mindfulness, relaxation techniques, psychoeducation, emotion regulation, cognitive strategies, problem-solving, and strengthening support networks [60]. Nevertheless, for a more conclusive understanding, there's an imperative for rigorous, advanced research characterized by more comprehensive study designs, expanded sample sizes, and prolonged observation periods.

4.3. Limitations and implications

This study had some limitations: (I) The inclusion of studies was restricted to those published in English. As a result, the findings might not fully capture the research and developments on resilience among HCWs in non-English speaking areas. (II) Our search strategy focused on titles containing 'resilience' and 'healthcare workers,' complemented by a manual review of the retrieved articles. While this method ensured a targeted investigation, it may have overlooked relevant studies that did not explicitly mention these terms in their titles. (III) The analysis included manually merging synonyms and similar terms for authors and keywords, a task made complex by the study's many contributors. Some authors might have changed names or been affiliated with multiple institutions. The potential for bias due to synonyms and similar terms could not be eliminated. (IV) Recent, high-quality studies might have been excluded if they had not yet achieved significant citation numbers, possibly impacting the identification of research hotspots and emerging trends. (V) While the SCIE and SSCI databases from WoSCC are widely regarded as comprehensive and reliable for bibliometric research, they may not encompass all relevant literature and citations in this field, potentially limiting the study's scope.

Despite its limitations, this study significantly advances our understanding of HCWs' resilience, effectively illuminating key focus areas and emerging trends. This study is the first bibliometric analysis of resilience in HCWs, providing critical insights and guidance for future research in this field. This study offers a comprehensive and impartial overview of current topics and innovative advancements, equipping scholars with a well-informed perspective. Lastly, the adoption of CiteSpace and VOSviewer as the primary analytical tools, widely recognized in bibliometrics, guarantees an objective and reliable data analysis process.

5. Conclusion

The bibliometric analysis offers an objective, quantitative approach to assessing trends and frontiers in the field of HCWs' resilience. From 2020 onwards, the bibliometric analysis highlights a significant increase in research output, emphasizing the growing academic interest in the resilience of HCWs, especially during the COVID-19 pandemic. The United States, China, Australia, and England stand out as leading contributors, demonstrating robust international cooperation through collaborative networks. Institutional analysis further clarifies the significant role of key universities and research centers in advancing this field, with their contributions notable in both publication output and citation impact. Several key areas were identified in this field, including the impact of COVID-19 on healthcare workers, stress and burnout, and the significance of resilience. This study summarized the intellectual foundations in this field, identified current research focuses and emerging trends, and offered valuable guidance for future researchers in selecting appropriate research directions.

Ethics approval and consent to participate

Not applicable.

Funding

None.

Data availability statement

The authors assert that the database generated in this study is available from the corresponding author upon written request.

CRediT authorship contribution statement

Luhuan Yang: Writing – original draft, Software, Methodology, Conceptualization. **Zifeng Li:** Writing – original draft, Software, Methodology, Data curation. **Yunhong Lei:** Software, Methodology, Investigation, Formal analysis, Conceptualization. **Jinglan Liu:** Visualization, Resources, Methodology, Investigation, Data curation. **Rong Zhang:** Visualization, Supervision, Project administration, Conceptualization. **Wei Lei:** Software, Resources, Project administration, Investigation, Formal analysis. **Abd Rahman Anita:** Writing – review & editing, Supervision, Project administration, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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