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The impact of COVID-19 pandemic on students' mental health: Overview of research indexed in the Scopus database

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ABSTRACT

Introduction and objectives: The global spread of the new coronavirus (COVID-19) has substantially impacted people's lives, negatively impacting students' mental health worldwide. This study aims to map research efforts presented over the past years and potential networks and collaborations in the fields using bibliometric analysis from documents indexed in the Scopus database.

Methods: Bibliometric analysis of articles published on the impact of the COVID-19 pandemic on students' mental health were accessed and analyzed using bibliometrix and R studio.

Results and conclusions: The study identified 2,564 documents from 2020-2021 published in the Scopus database. About 11,161 authors, 91 countries, and 642 organizations contributed to the research on the impact of the COVID-19 pandemic on students' mental health. The research collaboration index was 4.59. The top-most cited article was written by Wang et al. (2020) in the International Journal of Environmental Research and Public Health with total citations of 3,599. The "International Journal of Environmental Research and Public Health" was the most productive, with 144 publications. The top-productive corresponding author country was the USA, with 412 articles. The thematic structure analysis shows the 75 keyword terms of hot research spots within five different clusters. The bibliometric research revealed an increasing annual trend of manuscripts on the impact of the COVID-19 pandemic on students' mental health. It also highlighted the authors and countries working in this research field.

Keywords: COVID-19 pandemic, bibliometric analysis, Scopus, students' mental health

INTRODUCTION

A cluster of individuals with pneumonia of unknown cause was linked to a seafood wholesale market in Wuhan, China, in December 2019 [1]. A novel coronavirus was later identified as the cause of this disease [2-4]. Since the new coronavirus was declared a worldwide pandemic, governments across the globe have implemented stringent public-health measures to limit the epidemic and reduce the number of deaths [5].

Worldwide, until March 10, 2022, over 451 million confirmed cases, about 385 million recovered, and more than six million confirmed deaths were reported [6]. The COVID-19 outbreak has resulted in lockdown restrictions imposed in many countries, and many businesses were shut down in concerted efforts to halt the spread of the virus [7]. Many countries worldwide use containment measures to combat COVID-19, such as quarantine, country lockdown, travel restrictions, isolation, social distancing, and local restrictions on individuals' mobility, which can harm mental health, causing emotional and behavioral changes [8-12].

Bans on university attendance, staying at home, not meeting friends, not exercising, and not traveling, as well as the fear of becoming infected or infecting any of their family members or friends, had a direct impact on university students [13]. Such students will be deprived of crucial motivation to advance in their education or careers. University students are prone to developing stress disorders and depression, and the likelihood of such consequences is projected to increase throughout the COVID-19 quarantine period [5]. This extremely stressful new existence, as well as the necessary measures to take before going out, returning home, or even going shopping, has contributed to the students' difficulties [13].

According to research, pandemics and related mass confinement has been linked to increased rates of stress, anxiety, depression, and post-traumatic stress disorder (PTSD) [9]. Anxiety, insomnia, anger, loneliness, fear, shame, helplessness, blame, guilt, and stigma were present during infectious disease outbreaks in previous studies [14, 15]. The COVID-19 pandemic and disruptions in various sectors, including academia, have forced students to live in a new academic and personal environment [16]. Even after the pandemic has been brought under control, its effects are expected to reverberate throughout higher education institutions globally [5].

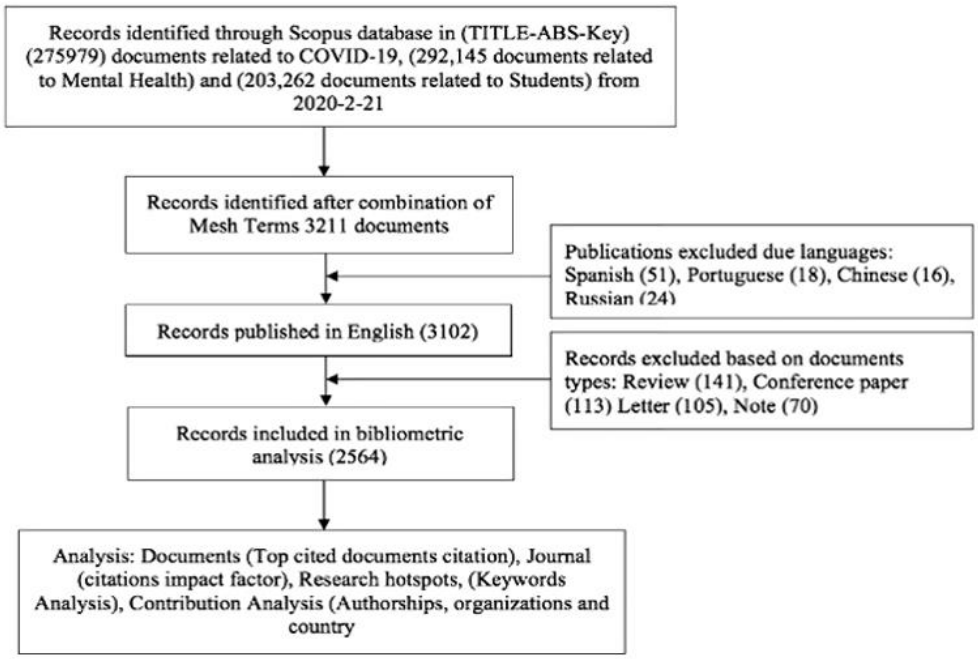

Figure 1. Flowchart showing the selection of documents

Researchers have previously used bibliometric methods to investigate COVID-19 and vaccine safety [17] and the impact of the COVID-19 pandemic on mental health [18]. Mental health problems are prevalent among students, and the pandemic has also added to this problem. As a result, the goal of this study is to use a bibliometric approach to map research efforts related to the mental health effects of the COVID-19 pandemic on students, as well as to evaluate the role of authors, journals, and institutions, the potential networks, and collaborations in this research area.

METHODS AND MATERIALS

Design of the Study and Data Sources

This study used bibliometric analysis to look for publications about the impact of the COVID-19 pandemic on students' mental health that was compiled in the Scopus database.

Literature Search Strategy

The database search in Scopus (https://www.scopus.com/) was performed on February 8, 2022. The following search terms were used in Scopus : ((TITLE-ABS-KEY (COVID-19*) OR TITLE-ABS-KEY (covid-19*) OR TITLE-ABS-KEY (novel coronavirus*) OR TITLE-ABS-KEY (2019 novel coronavirus pneumonia*) OR TITLE-ABS-KEY (covid-19 pneumonia*) OR TITLE-ABS-KEY (2019-ncov*) OR TITLE-ABS-KEY (corona virus*) OR TITLE-ABS-KEY (coronavirus*) OR TITLE-ABS-KEY (sars-cov-2*) OR TITLE-ABS-KEY (coronavirus-19*) OR TITLE-ABS-KEY (coronaviruses*) OR TITLE-ABS-KEY (corona virus disease*) OR TITLE-ABS-KEY (corona virus 2019*) OR TITLE-ABS-KEY (covid19*) OR TITLE-ABS-KEY (covid19*) OR TITLE-ABS-KEY (ncov2019*) OR TITLE-ABS-KEY (sars-cov2*))) AND ((TITLE-ABS-KEY (Mental health*) OR TITLE-ABS-KEY (mental health*) OR TITLE-ABS-KEY (anxiety) OR TITLE-ABS-KEY (depression) OR TITLE-ABS-KEY (mental wellbeing*) OR TITLE-ABS-KEY (psychological health*) OR TITLE-ABS-KEY (mental illness*) OR TITLE-ABS-KEY (mental disorder*) OR TITLE-ABS-KEY (mental problem*) OR TITLE-ABS-KEY (emotional health*) OR TITLE-ABS-KEY (PTSD) OR TITLE-ABS-KEY (post-traumatic stress*) OR TITLE-ABS-KEY (mental disease*) OR TITLE-ABS-KEY (trauma) OR TITLE-ABS-KEY (social well-being*))) AND ((TITLE-ABS-KEY (students) OR TITLE-ABS-KEY (university students*) OR TITLE-ABS-KEY (college students*))). After syncing the mesh terms in COVID-19, mental health, and students, the search yielded 2,564 documents. Only English-published articles were considered in this study, so documents were further screened based on "language." Furthermore, this study only included original research articles. The database search in Scopus was conducted on a single day. We then progressed to assess the retrieved documents.

Figure 1 is a flowchart that shows information about the search strategy used in this study.

Criteria for Inclusion and Exclusion

Only publications that directly listed the keywords relevant to the review question were included in the bibliometric analysis. The time frame was limited to documents published in English from 2020 to 2021. Articles published in other languages were excluded. Authors, research category, keywords, country of origin, most frequently cited papers, productive journals, and affiliation were all examined using bibliometric indicators. The data extraction process is presented in the flow chart for the bibliometric analysis (**Figure 1**). Finally, the impact factor (IF) for journals was obtained for the year 2020 from the Journal Citation Report (JCR) database.

Analysis of Data

Number of publications (NP), total citations (TC), and h index, criteria for ranking performances in each category were used to assess information on the most cited documents, most productive sources, and authors. In addition, the collaboration between authors and the keyword co-occurrence were displayed using the Bibliometrix package in R [19].

Table 1. Main information about collected data

Description	Results	Description	Results
Timespan	2020-2021	Authors	
Sources (journals, books, etc.)	1,001	Authors	11,161
Documents	2-564	Author appearances	13,652
Average years from publication	1.2	Authors of single-authored documents	167
Average citations per documents	10.32	Authors of multi-authored documents	10,994
Average citations per year per doc	3.877	Authors collaboration	
References	104-579	Single-authored documents	167
Document types		Documents per author	0.23
Article	2,564	Authors per document	4.35
Document contents		Co-authors per documents	5.32
Keywords plus (ID)	4,157	Collaboration index	4.59
Author's keywords (DE)	4,434		

Table 2. Top-10 cited articles

SCR	Title of documents	Author	Name of journal	TC
1	Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) Epidemic among the general population in China	Wang et al. (2020)	Int J Environ Res Public Health	3,599
2	The psychological impact of the COVID-19 epidemic on college students in China	Cao et al. (2020)	Psychiatry Res	1,634
3	COVID-19 and mental health: A review of the existing literature	Rajkumar et al. (2020)	Asian J Psychiatry	1,290
4	Mental health effects of school closures during COVID-19	Lee et al. (2020)	Lancet Child Adolesc Health	481
5	Changes in sleep pattern, sense of time, and digital media use during COVID-19 lockdown in Italy	Cellini et al. (2020)	J Sleep Res	352
6	Prevalence and socio-demographic correlates of psychological health problems in Chinese adolescents during the outbreak of COVID-19	Zhou et al. (2020)	Eur Child Adolesc Psychiatry	346
7	Psychological effects of the COVID-19 outbreak and lockdown among students and workers of a Spanish university	Odriozola-Gonzalez et al. (2020)	Psychiatry Res	333
8	Students under lockdown: Comparisons of students' social networks and mental health before and during the COVID-19 crisis in Switzerland	Elmer et al. (2020)	Plos One	270
9	Impacts of the COVID-19 pandemic on life of higher education students: A global perspective	Aristovnik et al. (2020)	Sustainability	259
10	Prevalence and correlates of PTSD and depressive symptoms one month after the outbreak of the COVID-19 epidemic in a sample of home-quarantined Chinese university students	Tang et al. (2020)	J Affective Disord	244

Note. SCR: Standard competition ranking & TC: Total citations

Table 3. Top-10 most productive authors

SCR	Authors (n=11,161)	h index	NP	TC
1	Zhang J	7	19	405
2	Li X	9	17	243
3	Zhang Y	6	15	408
4	Wang Y	5	14	198
5	Zhang L	7	13	332
6	Zhang X	5	12	138
7	Lee J	4	11	95
8	Wang J	5	11	169
9	Zhang H	6	10	199
10	Wang C	4	10	189

Note. SCR: Standard competition ranking; NP: Number of publications; & TC: Total citations

RESULTS

Characteristics of the Metadata

A total of 2,564 documents were retrieved. In addition, 11,161 authors published these documents in 1,001 journal sources. The research collaboration index was 4.59. The basic details of the collected data are displayed in **Table 1**.

Annual Trend of Included Documents

The published articles reveal the research focus on "the impact of the COVID-19 pandemic on students' mental health." In 2020, 502 articles were recorded, followed by 2,062 articles in 2021. As a result, the result indicates a rise in the number of scientific papers published on the impact of the COVID-19 pandemic on students' mental health.

Top-10 Most Cited Documents

The top-10 most cited articles on the impact of the COVID-19 pandemic on students' mental health research are shown in **Table 2**.

Based on the citation score, "Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China," an article written by Wang et al. (2020) with TC of 3,599 citations ranked first. Ranking second is an article by Cao et al. (2020) titled "The psychological impact of the COVID-19 epidemic on college students in China" with TC of 1,634 citation scores.

Top-10 Most Productive Authors

11,161 authors contributed 2,564 manuscripts. The top-10 most productive authors on the impact of the COVID-19 pandemic on students' mental health research are displayed in **Table 3**. With 19 publications, Zhang J was the highest-ranking author, followed by Li X (17 publications), and Zhang Y (15 publications).

Table 4. Top-10 productive corresponding author country

SCR	Country (n=91)	NP	TC	AAC	SCP	MCP	MCPR
1	The USA	412	2635	6.396	372	40	0.0971[a]
2	China	286	8915	31.171	198	88	0.3077[a]
3	The UK	92	759	8.25	67	25	0.2717[a]
4	Spain	85	1088	12.8	54	31	0.3647[a]
5	India	84	691	8.226	72	12	0.1429[a]
6	Italy	77	1273	16.532	57	20	0.2597[a]
7	Canada	72	379	5.264	58	14	0.1944[a]
8	Turkey	72	390	5.417	66	6	0.0833[a]
9	Saudi Arabia	65	754	11.6	42	23	0.3538[a]
10	Germany	58	223	3.845	36	22	0.3793[a]

Note. SCR: Standard competition ranking; NP: Number of publications; TC: Total citations; AAC: Average article citations: SCP: Single country publication (intra-country collaboration); MCP: Multiple country publications (inter-country collaboration); MCPR: MCP ratio; & [a]Lower international collaboration (value: less than 0.50).

Table 5. Analysis of the most productive sources

SCR	Sources (n=1,001)	NP	TC	h index	IF (2020)
1	International Journal of Environmental Research and Public Health	141	5559	22	3.390
2	Frontiers in Psychology	83	953	15	2.988
3	Frontiers in Psychiatry	56	621	15	4.157
4	Plos ONE	40	984	13	3.240
5	Children and Youth Services Review	20	476	8	2.393
6	Journal of American College Health	20	77	4	3.093
7	Frontiers in Public Health	19	95	6	3.709
8	Journal of Affective Disorders	19	864	10	4.839
9	Sustainability (Switzerland)	19	425	7	3.251
10	Psychiatry Research	18	2300	11	3.222

Note. SCR: Standard competition ranking; NP: Number of publications; TC: Total citations; & IF: Impact factor

Figure 2. 100 keywords plus (wordCloud analysis) of the impact of COVID-19 pandemic on students' mental health

Analysis of the Most Productive Author's Country

The total number of publications on the impact of the COVID-19 pandemic on students' mental health research retrieved from the Scopus database was generated by 91 countries (**Table 4**). The USA was the most productive country in terms of the number of articles produced (NA=412), followed by China (NA=286) and the UK (NA=92). Also, the USA reported single country publications (SCP=372) and multiple country publication (MCP=40) documents.

Analysis of the Most Productive Sources

2,564 documents on the impact of the COVID-19 pandemic on students' mental health were published in 1,001 journals. The top-10 productive journals are shown in **Table 5**. "International Journal of Environmental Research and Public Health," with 141 publications, was the overall most productive source. **Table 5** contains further information on the journal h index and journal impact factor.

Top-10 Subject Categories

Supplementary table (**Table A1**) shown in **Appendix A** contains the top-subject categories on the impact of the COVID-19 pandemic on students' mental health research. Most of the articles were centered on medicine (NA=1,118), followed by social sciences (NA=413), and psychology (NA=235).

Top-100 Keywords Plus (Word Cloud Analysis)

In **Figure 2**, the top-10 frequently used keywords were listed to explain keyword co-occurrence. Keywords such as "female" (1,534), "male" (1,457), "human" (1,337), "adult" (1,173), "pandemic" (1,138), "covid-19" (1,055), "humans" (980), "mental health" (925), "article" (916), and "coronavirus disease 2019" (875) were reportedly the most frequently used keywords by authors.

Analysis of Network Visualization

The authors' collaboration network analysis was presented in six clusters, with Zhang J being the most prolific. In a study of country collaboration networks, the USA was the most productive. This data was organized into four color-coded groups. In addition, the collaboration network between organizations and affiliations was displayed in eight clusters of various colors, with Sichuan University being the mostrelevant affiliation.

Analysis of the Conceptual Structure

Figure 3 uses a factorial analysis and multiple correspondence analysis (MCA) to highlight the standard and notable conceptual frameworks of retrieved articles for 75 keywords grouped in five clusters. **Figure 4** shows the correspondence analysis (CA) results for 75 keyword phrases distributed across five clusters.

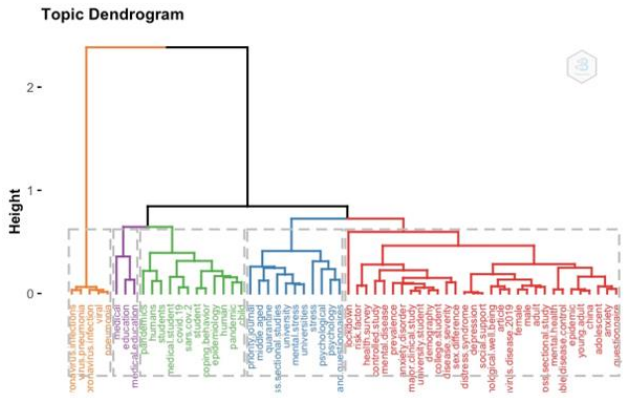

Figure 3. The frequency analysis of 75 keywords were subjected to a factorial analysis using the multiple correspondence analysis (MCA) approach, which was then dispersed into five clusters

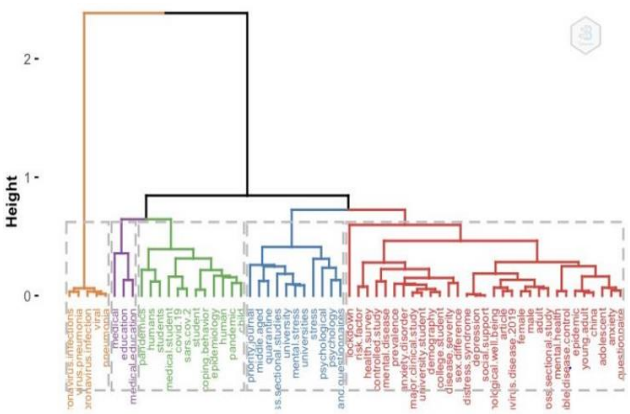

Figure 4. The frequency analysis of 75 keywords were subjected to a factorial analysis using the correspondence analysis (CA) approach, which was then dispersed into five clusters

DISCUSSION

With the discovery of a novel infectious coronavirus disease (COVID-19) and the coronavirus pandemic in 2019 [20], many areas of people's lives were disturbed, including their mental health and well-being [21]. Over the last two decades, coronaviruses have been responsible for three large-scale outbreaks [22]. Various transmission mechanisms for SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2), including aerosol, surface contamination, and the fecal–oral route, have been hypothesized as complicating variables in the current COVID-19 pandemic; hence, their relative importance is still being explored [23]. On March 1, 2020, the WHO labeled the outbreak a pandemic [20]. Following the declaration of the COVID-19 pandemic, several countries implemented a variety of austerity measures to stem the spread of the infectious disease, which significantly impacted people's lives and resulted in some adverse psychological outcomes and feelings (e.g., anger, confusion, distress, loneliness, and depression) [9]. Bans on face-to-face university attendance, remaining at home, not meeting friends, not exercising, nottraveling, as well as the fear of getting sick or infecting others, had a direct influence on university students [13]. This current study uses the Scopus database to provide an overview of the research topic from a bibliometric perspective and evaluate authors', journals', and institutional roles. The bibliometrics analytical approach has been employed across various scientific disciplines because of its capacity to illustrate the relationship between intellectual units within a scientific topic [24-26].

According to the findings of this investigation, the most cited publication on the impact of the COVID-19 pandemic on students' mental health was published in 2020 by Wang et al. (2020) under the title "Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China." The study looked at the characteristics that predict psychological distress in students and possible intervention pathways. Other papers often cited were "The psychological impact of the COVID-19 epidemic on college students in China" and "COVID-19 and mental health: A review of the existing literature." According to the available evidence, Zhang J was the top-author contributing research study on this topic of interest, with an NP=19 and a total of 405 citations. The corresponding author analysis presents the USA as the top-cited corresponding author country with up to 2,635 total citations, followed by China, India, and the UK. Because of the size of its economy and degree of research effort, the USA has long been a global scientific leader [27].

In **Table 4**, the journal result offers insight into the journals supporting research on the mental health impact of the COVID-19 pandemic on students. The International Journal of Environmental Research and Public Health was the top-journal publisher.

The top-research domain on the research topic "The impact of COVID-19 pandemic on students' mental health" was "medicine," with about 1,118 estimated publications, followed by "social sciences" and "psychology."

The word cloud analysis shows the most prominent keyword in the research: "The impact of COVID-19 pandemic on students' mental health." In addition, the most occurring word was "female." This information shows that special attention has been placed on females. Similarly, "male," "human," "adult," and "pandemic" were some of the top-occurring keywords in the word cloud. Coronavirus infections and virus pneumonia-related terms were prominent in all the five clusters derived from the factorial analysis of the conceptual frameworks.

Research Implications

According to the World Health Organization, promoting mental health and the prevention of mental disorders can help to improve health and influence quality of life [28]. The emergence of COVID-19 has led to a downward spiral in the mental health of individuals due to its piling effect upon existing mental stressors. Moreover, at the same time, it has triggered more psychological burdens and unhealthy coping mechanisms amongst students [29, 30]. The bibliometric analysis results suggest that impressive efforts have been made to examine publications on the effect of the COVID-19 pandemic on students' mental health in medicine, social and psychological research. Most of the publications were centered on students in the USA and China, while continents like Africa, although having a significant population of students was not adequately represented. Therefore, future research should focus on filling the gap in the paucity of studies on COVID-19's effects on mental health in African nations and other developing countries.

Additionally, most of the studies were country-specific; however, different results can be obtained when authors work with authors from other nations. Additional strategies used in various nations to combat mental health issues can be shared, fostering knowledge exchange, and expanding the research community. Furthermore, working together will highlight strategies to lessen or address students' mental health issues. Here, the advantages and disadvantages of various approaches can be examined, and the good and practicable ones can be used to address the mental health problems that affect a significant portion of the student population.

Interventions for Post-Pandemic Mental Health Recovery Among Vulnerable Students

Psychological stressors are very draining, and PTSD from the pandemic might be an inevitable reality for students with severe mental and emotional distress. Stress interventions might include scheduled checks to evaluate the well-being of students, counseling on self-love and mindfulness, art-based interventions for intellectual stimulation, and mindfulness-based approaches that effectively reduce the effect of stresson university students [31]. Since the effect of the COVID-19 pandemic will continue to ripple through academic institutions even after it is brought under control, we would like to recommend the following:

1. A mental health program developed to monitor the mental health status of students' is required.
2. There is a need for a proper follow-up to document the recovery of students' post-pandemic.
3. Coping strategies such as extracurricular activities to boost social interaction must be introduced.
4. Also, students need to be reassured of social support at school and at home.

Strengths and Limitations

The present research study of the COVID-19 pandemic's mental health impact on university students provides a complete mapping and "snapshot" of research trends and production for articles indexed in the Scopus database on this subject. Although it provides the reader with comprehensive information on research productivity and insight into the peculiarities of mental health research, there are a few constraints to consider. Firstly, the investigation was limited to a single database (Scopus). In addition, this analysis solely included documents published in English. Other databases, such as PubMed, Google Scholar, and Web of Science, were excluded from this study. Finally, the total citation score was also used to assess the top-cited papers. On the other hand, authors have self-citations, which might affect the overall number of citations and h-index. Besides these limitations, the study also shows that the total number of citations on the research topic increased in 2021 and provides essential insights into countries with the highest affected rate of the COVID-19 pandemic. The study also proposes the importance of building and sustaining research collaborations between Asia and other countries worldwide.

CONCLUSION

The overall number of papers in the Scopus database reflects the advancement in COVID-19-related mental health research. This database is the world's most widely available repository and extracting papers from it provides valuable insight into the global status of ongoing research, allowing researchers to track their progress and set milestones. This study is the first attempt to present bibliometric evidence on the international research output on the mental health impact of the COVID-19 pandemic on students. This bibliometric analysis has pointed out the contribution of researchers in this research domain around the globe. By examining the bibliometric properties of this research, the present study confirms that the Journals are broad in scope, interdisciplinary, and genuinely international concerning their contributors. Furthermore, several of the contributions include authors from two or more countries. In these regards, the documents included in this study are unique and crucial for the international community working tirelessly towards eradicating the coronavirus and its effect on mental health.

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APPENDIX A

Table A1. Top-10 subject areas

Subject areas	Number of articles
Medicine	1118
Social sciences	413
Psychology	235
Environmental science	209
Nursing	110
Health professions	107
Neuroscience	98
Multidisciplinary	83
Arts & humanities	80
Pharmacology, toxicology, & pharmaceutics	76