

Global Research Trends at the Intersection of Coronavirus Disease 2019 (COVID-19) and Traditional, Integrative, and Complementary and Alternative Medicine: A Bibliometric Analysis

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Research Article

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Abstract

Background: Coronavirus disease 2019 (COVID-19) is a novel infectious disease caused by severe acute respiratory syndrome coronavirus 2, and responsible for a global pandemic. Despite there being no known vaccines or medicines that prevent or cure COVID-19, many traditional, integrative, complementary and alternative medicines (TICAMs) have been touted as the solution, as well as researched as a potential remedy globally. This study presents a bibliometric analysis of global research trends at the intersection of TICAM and COVID-19.

Methods: SCOPUS, MEDLINE, EMBASE, AMED and PSYCHINFO databases were searched on June 5, 2020, with results being exported on the same day. All publication types were included, however, articles were only deemed eligible if they made mention of one or more TICAMs for the potential prevention, treatment, and/or management of COVID-19. The following eligible article characteristics were extracted: title; author names, affiliations, and countries; DOI; publication language; publication type; publication year; journal (and whether it is TICAM-focused); impact factor, and TICAMs mentioned.

Results: A total of 178 eligible articles were published by 856 unique authors at 541 affiliations across 43 countries. The most common countries associated with author affiliation included China, United States, Italy and India. The vast majority of articles were published in English, followed by Chinese. Eligible articles were published across 100 journals, of which 24 were TICAM-focussed; only 69 journals had a 2018 impact factor, which ranged from 0.672-59.102. A total of 180 TICAMs were mentioned across eligible articles, with the most common ones including: Traditional Chinese Medicine (n=64), vitamin D (n=44), melatonin (n=10), general herbal medicine (n=9), and vitamin C (n=8).

Conclusions: This study provides researchers and clinicians with a greater knowledge of the characteristics of articles that been published globally at the intersection of COVID-19 and TICAM to date. At a time where safe and effective vaccines and medicines for the prevention and treatment of COVID-19 have yet to be discovered, this study may aid to guide the identification and exploration of understudied TICAM therapies that may hold potential in combatting the COVID-19 pandemic.

Background

The novel coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Originating from Wuhan, China, it was first identified in December 2019, and has resulted in an ongoing global pandemic [1]. As of June 6, 2020, more than 6.87 million cases have been reported across 188 countries and territories, resulting in more than 400,000 deaths [2]. While certain practices such as physical distancing, self-isolation and frequent handwashing mitigate the spread of COVID-19, to date there are no vaccines or medications have been shown to prevent or treat the disease [1]. Despite this, a wide plethora of traditional, integrative, complementary and alternative medicines (TICAMs) have been touted as the solution, despite the paucity of evidence surrounding the safety and effectiveness of such therapies [3-5]. National governments have taken a

wide-range of stances on TICAMs; China and India are among those promoting their respective traditional medicines [6-8]. In contrast, government mention of TICAMs in the context of COVID-19 typically come in the form of warnings of potential harm and fraudulent claims in Western countries such as the United States, Canada and Australia [5,9,10].

Despite varying government stances, it can be argued that all governments globally have a vested interest in researching promising COVID-19 therapies, which undoubtedly includes TICAMs. A number of initiatives have been launched to support ongoing research in this area, including the establishment of the Traditional, Complementary and Integrative Health and Medicine COVID-19 Support Registry [11]. Additionally, in early May 2020, the World Health Organization's Regional Office for Africa issued a statement of support for scientifically-proven traditional medicine in the search for potential treatments for COVID-19 [12]. Unsurprisingly, there has been an uptick in the amount of research being conducted at the intersection of TICAM and COVID-19 and preliminary searches on academic databases such as PubMed or Google Scholar indicate a growing number of peer-reviewed publications.

To date, no study has assessed the characteristics of these publications, thus the purpose of the present study is to conduct a bibliometric analysis of global research trends at the intersection of TICAM and COVID-19. This bibliometric analysis provides current insight into the most commonly researched TICAM therapies, the institutions leading the studies, and the journals publishing the findings. Thus, this study's findings are relevant to researchers and practitioners internationally, as it summarizes early and emerging research and may aid to guide the identification and exploration of understudied TICAM therapies that may hold potential in combatting the COVID-19 pandemic.

Methods

Searches were conducted on SCOPUS, MEDLINE, EMBASE, AMED and PSYCHINFO databases on June 5, 2020. Searches were all conducted with search results exported on the same day to prevent discrepancies between daily database updates. While recently published COVID-19-related bibliometric analyses have commonly employed searches across only one or two databases [13-15], multiple databases were selected in the present study to maximize the quantity of peer-reviewed publications captured at the intersection of TICAM and COVID-19. As TICAM is comprised of a very wide-range of therapies, the development of a comprehensive search strategy was informed by both a comprehensive list of TICAM therapies provided by the National Center for Complementary and Integrative Health [16], as well as a past textual analysis of common terms used to describe TICAM conducted by the author [17]. Only articles published in 2020 were included, given that the emergence of COVID-19 is very novel. Articles were only included if they made mention of one or more TICAMs for the potential prevention, treatment, and/or management of COVID-19. No restrictions were placed on article type or language. The complete SCOPUS and OVID (latter aforementioned four databases) search strategies are provided in **Appendix 1**.

The following data were extracted from each eligible article: title, author names, affiliations, author affiliated countries, DOI, language of publication, publication type, year of publication, journal, whether

the article was published in a TICAM-focused journal, 2018 journal impact factor, and type(s) of TICAM mentioned. The impact factor of the journals is reported by InCites Journal Citation Reports was used [18]. Global trends associated with all eligible articles were identified and presented.

Results

Searches across all academic databases retrieved a total of 372 titles, of which 142 were duplicate and 230 were unique. Of the unique articles, 178 were eligible as they mentioned at least one TICAM for the potential prevention, treatment, and/or management of COVID-19. The remaining 52 full-text articles were excluded for the following reasons: not about COVID-19 (n=31); not about or focussed on one or more TICAM therapy (n=19); and only discussed internal vitamin levels, without mention of supplementation therapy (n=2). A bibliometric analysis flowchart is provided in **Figure 1**.

Across all 178 publications and 967 authors, 856 were unique. The number of publications per author ranged from 1 to 5. Authors were affiliated with a total of 541 affiliations across 43 countries. Authors were all from the same affiliation country in 129 publications, two countries in 43 publications, three countries in 13 publications, and a single publication contained 8 countries of affiliation. The number of articles containing affiliations from the following countries were as follows: China (n=76), United States (n=29), Italy (n=17), India (n=16), United Kingdom (n=13), Ireland (n=10), Australia (n=8), Canada (n=6), South Korea (n=5), Saudi Arabia (n=4), Spain (n=3), and Turkey (n=3). Additionally, two affiliations each were associated with the following countries: Argentina, Brazil, Denmark, France, Hong Kong, Iran, Lebanon, Macau, Malaysia, Pakistan, Portugal, Switzerland and Vietnam. One affiliation each was associated with the following countries: Austria, Bangladesh, Belgium, Chile, Columbia, Croatia, Finland, Germany, Hungary, Israel, Jordan, New Zealand, Nigeria, Poland, Romania, Russian Federation, Singapore, Sweden, Taiwan, and Thailand. Six articles did not have declared affiliations/countries associated with their articles. Eligible articles were primarily published English (n=144), followed by Chinese (n=30), German (n=2), and Italian (n=2). Additionally, three of the articles published in English were also published in an additional language: Spanish (n=2) and Czech (n=1). Eligible articles found were indexed by the academic databases searched as the following publication types: article (n=95), letter (n=38), review (n=28), editorial (n=9), note (n=6), erratum (n=1), and news (n=1). The general characteristics of eligible articles are summarized in **Table 1**.

Table 1: General Characteristics of Eligible Articles

Number of Publications	178
Number of Authors	967 (856 unique)
Number of Publications Per Author	1 (n=769)
	2 (n=70)
	3 (n=13)
	4 (n=1)
	5 (n=3)
Number of Countries Affiliated Per Publication	1 (n=129)
	2 (n=43)
	3 (n=13)
	3+ (n=1)
Most Commonly Affiliated Countries	China (n=76)
	United States (n=29)
	Italy (n=17)
	India (n=16)
Language of Publication	English (n=144)
	Chinese (n=30)
	German (n=2)
	Italian (n=2)
Publication Types	Article (n=95)
	Letter (n=38)
	Review (n=28)
	Editorial (n=9)
	Note (n=6)
	Erratum (n=1)
	News (n=1)

In total, the 178 eligible articles were published in a total of 100 journals, of which 24 were identified to be TICAM-focussed journals. Sixty-one articles were published in TICAM-focussed journals. After hand-searching each journal on InCites Journal Citation Reports, it was found that sixty-nine journals had a 2018 impact factor. Of these 69 journals, impact factors ranged widely from 0.672 to 59.102. In total, 103 articles were published in a journal with a 2018 impact factor. The number of articles published per journal ranged from 1 to 14; details about the 14 journals with the highest number of articles are provided in **Table 2**.

Table 2: Top 14 Most Published Journals

Journal	TICAM Journal	2018 Journal Impact Factor	Number of Articles
Chinese Traditional and Herbal Drugs	Yes	N/A	14
Zhongguo Zhongyao Zazhi (China Journal of Chinese Materia Medica)	Yes	N/A	13
Alimentary Pharmacology and Therapeutics	No	7.731	8
Irish Medical Journal	No	N/A	7
Pharmacological Research	No	5.574	6
Journal of Biomolecular Structure & Dynamics	No	3.310	5
Life Sciences	No	3.448	5
Journal of Integrative Medicine	Yes	N/A	4
Nutrients	No	4.171	4
American Journal of Physiology - Endocrinology & Metabolism	No	4.125	3
Brain, Behavior, and Immunity	No	6.170	3
Chiropractic and Manual Therapies	Yes	N/A	3
Medical Hypotheses	No	1.322	3
Medicine in Drug Discovery	No	N/A	3

A total of 180 TICAMs were mentioned across the 178 eligible articles, as follows: Traditional Chinese Medicine (n=64), vitamin D (n=44), melatonin (n=10), general herbal medicine (n=9), vitamin C (n=8), Ayurveda (n=7), probiotics (n=6), cannabis (n=5), phytochemicals (n=5), acupuncture (n=4), chiropractic (n=4), general TICAM (n=2), antioxidants (n=1), bioflavonoids (n=1), dietary supplements (n=1), garlic essential oil (n=1), glycyrrhetic acid (n=1), indigenous herbal medicine (n=1), marine algal antioxidants (n=1), meditation/mindfulness (n=1), phytotherapy (n=1), tea (n=1), traditional Persian medicine (n=1), and zinc iodide and dimethyl sulfoxide (n=1). A number of studies incorporated one or more other TICAMs in combination with the aforementioned therapies as follows: moxibustion (n=2, with acupuncture), curcumin and glycyrrhizic acid (n=1, with vitamin c), exercise (n=1, with vitamin d), natural products (n=1, with Ayurveda), quercetin and estradiol (n=1, with vitamin d), and yoga (n=1, with Ayurveda). This is summarized in **Table 3**.

Table 3: Most Common TICAMs across Eligible Publications

TICAM	Number of Publications (n=)
Traditional Chinese Medicine	64
Vitamin D	44
Melatonin	10
General Herbal Medicine	9
Vitamin C	8
Ayurveda	7
Probiotics	6
Cannabis	5
Phytochemicals	5
Acupuncture	4
Chiropractic	4
Other	14
Total	180

The entire dataset containing all of the aforementioned characteristics of all eligible articles is provided in **Supplementary File 1** for the benefit of researchers and clinicians who seek to read the original publications, use this data to support further research, and foster future collaborations to investigate promising TICAMs in combatting the ongoing COVID-19 pandemic.

Discussion

The present study provides a current and needed bibliometric analysis of global research trends at the intersection of COVID-19 and TICAM, as of June 2020. A wide-range of efforts are taking place globally to investigate TICAMs with the potential to prevent, treat and/or manage COVID-19, with the most research-productive countries being China, the United States, Italy and India. These findings are not entirely surprising, given that researchers in China likely initiated research earlier than the rest of the world as this is where the virus originated [1]. The United States and Italy are two countries that have suffered some of the largest casualties as a result of the global pandemic [2]. Like China, India also has a centuries-old traditional medicine system [19,20], offering various TICAMs that could be potentially repurposed to treat COVID-19 patients [21]. It is also unsurprising that the vast majority of eligible articles were published in the English language, as this is considered the most widely-used language to disseminate research findings; additionally the vast majority of articles indexed in the databases searched are written in English [22].

Eligible articles were found to have been published in a wide-range of journals, covering a wide-range of topics and disciplines. Only about one quarter of the total number of articles were published in a TICAM-focussed journal. One particularly important finding is the fact that over 40% of eligible articles were not published in a journal with an InCites Journal Citation Reports impact factor as of 2018 [18]. Despite all eligible articles being indexed in either SCOPUS, MEDLINE, or EMBASE databases, and while acknowledging that the impact factor is not without its limitations, nor is it the only metric by which to

assess the true “impact” of research conducted [23,24], this finding does, however, draw into question the potential quality and readership of such studies.

In terms of TICAMs mentioned, it was found that a disproportionately large number of articles mentioned traditional Chinese medicine, beyond the fact that the vast majority of these articles were published by researchers with an affiliation in China. Interestingly, almost all TICAMs mentioned across all articles were either natural health products (i.e. vitamins, herbs), or a system of traditional medicine that incorporates these supplements. Vitamin D, melatonin, and vitamin C were also relatively commonly discussed across eligible articles found. Surprisingly little research has been published at the intersection of COVID-19 and modalities such as mind-body medicine, manipulative and body-based practices, as well as TICAM whole medical systems outside of traditional Chinese Medicine and Ayurveda, such as naturopathy and chiropractic. Thus, it is hoped that this study can be of value internationally to researchers and clinicians with an interest in TICAM by offering a better understanding of the current research being conducted and published at this intersection, including knowledge of what topics are being studied, by whom and where. It is hoped that this, in turn, can inspire fruitful collaborations between TICAM experts who may not have otherwise known about each other’s work, especially at this crucial time where safe and effective vaccines and medicines for the prevention and treatment of COVID-19 have yet to be identified.

Strengths and Limitations

This bibliometric study contained a number of notable strengths including the fact that a highly comprehensive search including a wide-range of TICAM-related search terms was developed. Another strength includes the fact that searches were conducted across five unique and large academic databases, thus capturing the vast majority indexed literature that has been published at the intersection of COVID-19 and TICAM. While articles published any language were included in the bibliometric analysis itself, one limitation includes the fact that no non-English academic databases were searched. Furthermore, even English-language articles published in reputable journals would not have been captured if they were not indexed in the five databases searched. Additionally, number of citations per article were not provided as only the Scopus database provides this metric. This is a common reason why many bibliometric analyses only report searches on this single database, however, given that this literature is very new and much is likely to change in the coming months, it was decided that this was not the most relevant nor important metric to capture for the purpose of the present study.

Conclusions

The present study is the first bibliometric analysis to date of global research trends at the intersection of COVID-19 and TICAM. Findings include the fact that a wide-range TICAMs have been mentioned across articles found; a total of 180 TICAMs were mentioned across the 178 eligible articles with the vast majority of them including traditional Chinese medicine and vitamin D supplementation. Eligible articles were published by a total of 856 authors with affiliations in 43 countries, the most common of which

include China, the United States, Italy and India. At a time where safe and effective vaccines and medicines for the prevention and treatment of COVID-19 have yet to be discovered, this study provides researchers and clinicians with a greater knowledge of the characteristics of articles that been published at the intersection of COVID-19 and TICAM to date.

List Of Abbreviations

COVID-19: coronavirus disease 2019

TICAM: traditional, integrative, complementary and alternative medicine

Declarations

Ethics Approval and Consent to Participate

This study involved a bibliometric analysis of the literature only; it did not require ethics approval or consent to participate.

Consent for Publication

The author consents to this manuscript's publication.

Availability of Data and Materials

All data generated or analysed during this study are included in this published article [and supplementary file].

Competing Interests

The author declares that they have no competing interests.

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Authors' Contributions

JYN: conceptualized and designed the study, collected the data, interpreted and analysed the data, drafted the manuscript, and gave final approval of the version to be submitted.

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Appendix 1

Appendix 1: Search Strategies

SCOPUS Search Strategy

(TITLE((Acai) or (Acupuncture) or ("Aloe Vera") or ("Alternative Medicine*") or ("Alternative Therap*") or (Antioxidants) or (Aromatherapy) or ("Asian Ginseng") or (Astragalus) or (Ayurved*) or (Bilberry) or ("Bitter Orange") or ("Black Cohosh") or (Bromelain) or (Butterbur) or (Cannab*) or ("Cat's Claw") or (Chamomile) or (Chasteberry) or ("Chelation Therapy") or (Chiropract*) or (Chondroitin) or (Cinnamon) or (Cleanse*) or ("Coenzyme Q10") or ("Colloidal Silver") or ("Complementary and Alternative Medicine*") or ("Complementary and Alternative Therap*") or ("Complementary Medicine*") or ("Complementary Therap*") or (CoQ10) or (Cranberry) or (Cupping) or (Dandelion) or (Detox*) or ("Dietary Supplement*") or ("Dimethyl sulfoxide") or (Echinacea) or ("Energy Drink*") or (Ephedra) or ("European Elder") or ("European Mistletoe") or ("Evening Primrose*") or (Fenugreek) or (Feverfew) or (Flaxseed*) or ("Garcinia Cambogia") or (Garlic) or (Ginger) or (Ginkgo) or (Glucosamine) or (Goldenseal) or ("Grape Seed Extract") or ("Green Tea") or ("Guided Imagery") or (Hawthorn) or (Herb*) or (Homeopath*) or (Hoodia) or ("Horse Chestnut") or (Hypnosis) or ("Integrat* Medicine*") or ("Integrat* Therap*") or (Kava) or (Kratom) or (Lavender) or ("Licorice Root") or (Magnet*) or (Marijuana) or (Massage) or (Meditation) or (Melatonin) or (Methylsulfonylmethane) or ("Milk Thistle") or ("Mind-Body Medicine*") or ("Mind-Body Therap*") or (Mineral*) or (Natural Health Product*) or ("Natural Medicine*") or ("Natural Product*") or ("Natural Therap*") or (Naturopath*) or (Noni) or ("Omega-3 Fatty Acid*") or (Passionflower) or ("Peppermint Oil") or (Phyto*) or (Pomegranate) or (Probiotic*) or ("Progressive Relaxation") or ("Qi Gong") or ("Red Clover") or ("Red Yeast Rice") or (Reflexology) or (Reiki) or ("Relaxation Technique*") or (Rhodiola) or ("S-Adenosyl-L-methionine") or (Sage) or ("Saw Palmetto") or (Soy) or ("Spinal Manipulation*") or ("St. John's Wort") or ("Tai Chi") or (TCM) or ("Tea Tree Oil") or (Tea) or (Thunder God Vine) or ("Traditional Medicine*") or ("Traditional Chinese Medicine*") or (Turmeric) or (Valerian) or (Vitamin*) or (Yoga) or (Yohimbe))) AND ((covid-19) OR (covid19) or (coronavirus) or ("Coronavirus Disease 2019") or ("Severe Acute Respiratory Syndrome Coronavirus 2") or ("SARS-CoV-2")) AND (LIMIT-TO (PUBYEAR,2020))

OVID Search Strategy (MEDLINE, EMBASE, AMED, PSYCHINFO)

Database: AMED (Allied and Complementary Medicine) <1985 to June 2020>, Embase <1974 to 2020 June 04>, APA PsycInfo <1806 to June Week 1 2020>, Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Daily and Versions(R) <1946 to June 04, 2020>

Search Strategy:

-
- 1 (Acai or Acupuncture or "Aloe Vera" or "Alternative Medicine*" or "Alternative Therap*" or Antioxidants or Aromatherapy or "Asian Ginseng" or Astragalus or Ayurved* or Bilberry or "Bitter Orange" or "Black Cohosh" or Bromelain or Butterbur or Cannab* or "Cat's Claw" or Chamomile or Chasteberry or "Chelation Therapy" or Chiropract* or Chondroitin or Cinnamon or Cleanse* or "Coenzyme Q10" or "Colloidal Silver" or "Complementary and Alternative Medicine*" or "Complementary and Alternative Therap*" or "Complementary Medicine*" or "Complementary Therap*" or CoQ10 or Cranberry or Cupping or Dandelion or Detox* or "Dietary Supplement*" or "Dimethyl sulfoxide" or Echinacea or "Energy Drink*" or Ephedra or "European Elder" or "European Mistletoe" or "Evening Primrose*" or Fenugreek or Feverfew or Flaxseed* or "Garcinia Cambogia" or Garlic or Ginger or Ginkgo or Glucosamine or Goldenseal or "Grape Seed Extract" or "Green Tea" or "Guided Imagery" or Hawthorn or Herb* or Homeopath* or Hoodia or "Horse Chestnut" or Hypnosis or "Integrat* Medicine*" or "Integrat* Therap*" or Kava or Kratom or Lavender or "Licorice Root" or Magnet* or Marijuana or Massage or Meditation or Melatonin or Methylsulfonylmethane or "Milk Thistle" or "Mind-Body Medicine*" or "Mind-Body Therap*" or Mineral* or Natural Health Product* or "Natural Medicine*" or "Natural Product*" or "Natural Therap*" or Naturopath* or Noni or "Omega-3 Fatty Acid*" or Passionflower or "Peppermint Oil" or Phyto* or Pomegranate or Probiotic* or "Progressive Relaxation" or "Qi Gong" or "Red Clover" or "Red Yeast Rice" or Reflexology or Reiki or "Relaxation Technique*" or Rhodiola or "S-Adenosyl-L-methionine" or Sage or "Saw Palmetto" or Soy or "Spinal Manipulation*" or "St. John's Wort" or "Tai Chi" or TCM or "Tea Tree Oil" or Tea or Thunder God Vine or "Traditional Medicine*" or "Traditional Chinese Medicine*" or Turmeric or Valerian or Vitamin* or Yoga or Yohimbe).ti. (1287485)
 - 2 (Coronavirus or COVID-19 or COVID19 or Coronavirus or "Coronavirus Disease 2019" or "Severe Acute Respiratory Syndrome Coronavirus 2" or "SARS-CoV-2").mp. (77011)
 - 3 1 and 2 (429)
 - 4 remove duplicates from 3 (246)
 - 5 limit 4 to yr="2020 -Current" (189)

Figures

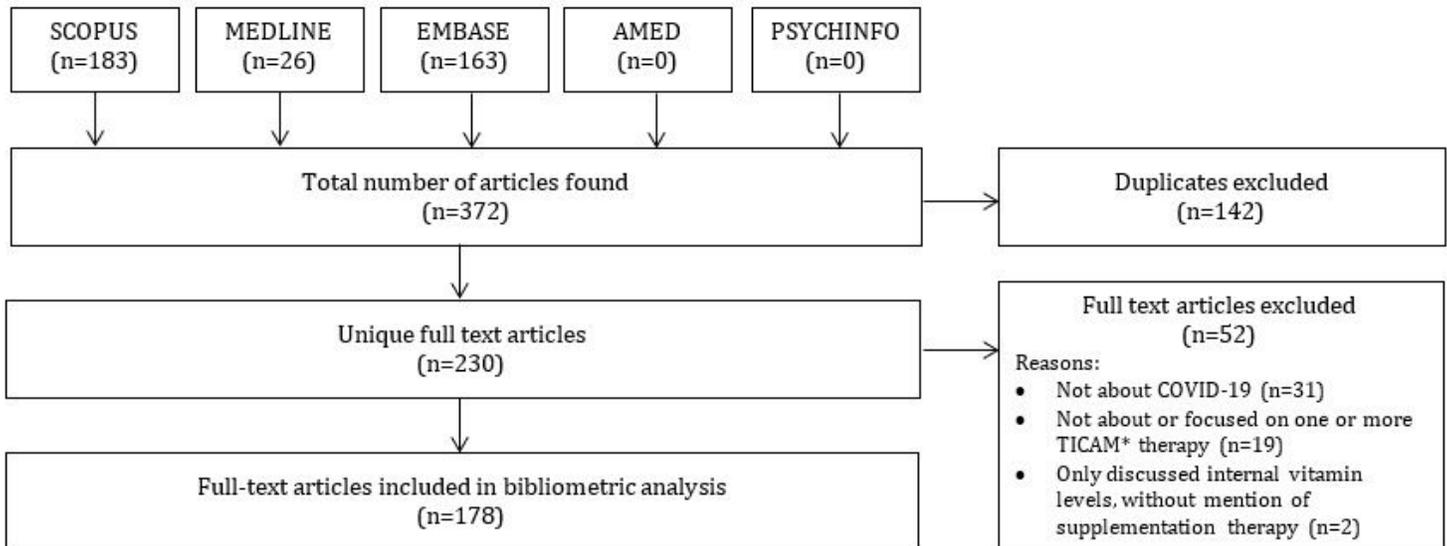


Figure 1

Bibliometric Analysis Flowchart. *Abbreviations: TICAM = traditional, integrative, complementary and alternative medicine

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [SupplementaryFile1Jun0720JYN.xlsx](#)