Integrative Medicine Research 10 (2021) 100801

Contents lists available at ScienceDirect

Integrative Medicine Research

journal homepage: www.elsevier.com/locate/imr

Review Article

Current state of research about acupuncture for the treatment of COVID-19: A scoping review

Chen Chen [a], Jie Zhan [b], Hao Wen [c], Xiaojing Wei [a], Lu Ding [a], Chenyang Tao [a], Cui Li [a], Peiming Zhang [a], Yuyuan Tang [a], Jingchun Zeng [d,*], Liming Lu [a,*]

[a] Guangzhou University of Chinese Medicine, Guangzhou, Guangdong, China
[b] Second Affiliated Hospital of Guangzhou University of Chinese Medicine, Guangzhou, Guangdong, China
[c] The Sun Yat-sen Memorial Hospital of Sun Yat-sen University, Guangzhou, Guangdong, China
[d] First Affiliated Hospital of Guangzhou University of Chinese Medicine, Guangzhou, Guangdong, China

ARTICLE INFO

Article history:
Received 23 August 2021
Revised 10 October 2021
Accepted 11 October 2021
Available online 14 October 2021

Keywords:
COVID-19
Acupuncture
Scoping review

ABSTRACT

Background: Since the outbreak of coronavirus disease (COVID-19), acupuncture has been widely used in the treatment of COVID-19. The research community has responded rapidly and has already published many research articles about this topic.

Methods: We searched PubMed, Embase, Cochrane Library as well as CNKI, Wanfang and VIP from January 1, 2020 to July 31, 2021. The dates of publication, language of publication, methodological characteristics and the key findings were analyzed separately. The data are presented as bar graphs, structured tables and figures.

Results: In this scoping review, 16 research articles were included: 7 case reports, 6 observational studies, 1 review, 1 RCT and 1 nonrandomized clinical trial. The majority of the articles (81.3%) were published by Chinese scholars, 12.5% articles were by scholars in the United States, and 6.3% articles were by scholars in Iran. The included studies reported that acupuncture could alleviate the symptoms of COVID-19 patients, shorten their hospitalization days, and is effective for the elderly. There were no side effects reported. The most frequent acupoints used were LI4, PC6, ST36 and KI3. They reported many obstacles in implementing acupuncture therapy for treating COVID-19 patients.

Conclusion: Acupuncture has a good effect for the treatment of COVID-19, but high-quality evidence support is still lacking. Coupled with the difficulties that acupuncturists experienced during the process of treatment, the promotion of acupuncture treatment for COVID-19 faces many obstacles.

1. Introduction

Coronavirus disease 2019 (COVID-19), an acute respiratory disease caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), has rapidly spread globally since the outbreak first reported in Wuhan in December 2019.[1] As declared by the World Health Organization (WHO), COVID-19 is a "public health emergency of international concern", and the pandemic is overloading health care facilities worldwide.[2] Globally, as of July 31, 2021, there were 196,553,009 confirmed cases, among which 4,200,412 deaths were reported to the WHO.[3]

Epidemiological investigations have shown that COVID-19 may cause various symptoms such as fever, dry cough, fatigue, anxiety, insomnia, nasal congestion, runny nose, sore throat, myalgia and diarrhea.[4,5,6] The severe cases may rapidly develop acute respiratory distress syndrome (ARDS), refractory metabolic acidosis, septic shock, hypoxemia and multiple organ dysfunction syndrome (MODS).[7,8]

Acupuncture, a major component of traditional Chinese medicine (TCM), has been widely adopted to treat respiratory diseases and relieve common symptoms such as anxiety disorders, nausea, insomnia, fatigue and so on in clinical practice.[9,10,11,12,13,14] Its efficacy has been assessed by a number of studies.[15] Because the epidemic first broke out in China and the properties of acupuncture played a significant role in the treatment

* Corresponding authors at: First Affiliated Hospital of Guangzhou University of Chinese Medicine, Guangzhou, Guangdong, 510006, China (J. Zeng); Guangzhou University of Chinese Medicine, No.232 Waihuan East Road, Guangzhou Higher Education Mega Center, Panyu District, Guangzhou, Guangdong, 510006, China (L. Lu).
E-mail addresses: bzyzdcc@sina.com (C. Chen), tcm_zjc@126.com (J. Zeng), lulimingleon@gzucm.edu.cn (L. Lu).

https://doi.org/10.1016/j.imr.2021.100801

of severe acute respiratory syndrome (SARS) in 2003,[16] acupuncture was widely used to treat COVID-19 in Wuhan, China. On March 5, 2020, the China Association of Acupuncture–Moxibustion (CAAM) developed and issued Guidance for Acupuncture and Moxibustion Intervention for COVID-19 (second edition) (hereinafter Guidance).[17] This guideline introduced the specific operations of acupuncture for the prevention and treatment of COVID-19.[18]

Given the spread of the new coronavirus and the application prospects of acupuncture in treating COVID-19, the acupuncture research community has responded rapidly and has already published many clinical research articles. To provide an overview of current knowledge on this topic and possibly provide information for new research and policy-makers, we conducted a scoping review to summarize and critically analyze the findings of all published articles on the clinical research into acupuncture treatment for COVID-19.

2. Methods

2.1. Study design

A scoping review was conducted following the methodological framework suggested by Arksey and O'Malley.[19] The following five steps were used to conduct this scoping review: a) identifying a clear research objective and search strategies, b) identifying relevant research articles, c) selection of the research articles, d) extraction and charting of the data, and e) summarizing, discussing, analyzing, and reporting the results. The central scoping review question was "What is the current state and main result of clinical research about acupuncture for the treatment of COVID-19".

2.2. Ethics

Ethics approval was not required for this scoping review.

2.3. Study selection

2.3.1. Types of studies

The focus of this scoping review was to provide an overview of currently published papers on clinical research about acupuncture treatment of COVID-19 patients. Therefore, we looked for systematic reviews, RCTs, quasi-RCTs, nonrandomized clinical trials, observational studies and case reports.

2.3.2. Inclusion criteria

(1) Full-text articles in English or Chinese.
(2) Studies with available full text.
(3) Participants: Patients with COVID-19.
(4) Interventions: Studies evaluating the use of acupuncture for the treatment of patients with COVID-19 were included. In this scoping review, we followed the World Health Organization's definition of acupuncture, as follows: acupuncture literally means puncturing with a needle. However, acupuncture may also involve the application of other kinds of stimulation to certain points. We included any type of commonly used acupuncture that stimulates certain points with needles, lasers, electricity, or pressure. The specific types of acupuncture therapies included in this manuscript were manual acupuncture, electroacupuncture, body needling, ear (auricular) acupuncture, scalp acupuncture, laser acupuncture, transcutaneous electrical nerve stimulation (TENS), and acupressure. Forms combined with moxibustion or medication, such as warm needling, acupoint injection, or hydroacupuncture, were excluded.[20]
(5) Outcomes: COVID-19- related mortality; days to loss of fever; symptom scores (symptoms included poor appetite, fatigue, cough, fever, diarrhea and constipation); duration of symptoms; olfactory score, absorption of the pulmonary infiltration (assessed with chest X-ray or CT scan); biochemical indices, quality of life; number of days in the hospital; discharge rate and adverse effects.

2.3.3. Exclusion criteria

Studies were excluded if one of the following criteria was met.

(1) Duplicated publication.
(2) Non-clinical study.
(3) Essential data or full-text of the study that could not be obtained after contacting the original author.

2.4. Database and search

The literature for this review was identified by searching the following online databases: PubMed, Embase, Cochrane Library, CNKI, Wanfang and VIP. We searched scientific publications from January 1, 2020 to July 31, 2021. Details of the search strategy are presented in Supplement 1.

2.5. Literature Identification

Two reviewers (C. Y. Tao and C. Li) conducted the study screening independently. They reviewed the abstracts and full texts and extracted the relevant information from the included studies. Disagreements on the inclusion or exclusion of literature were resolved through discussion or, if necessary, by including a third researcher (L. M. Lu) to make the final decision. Eventually, 16 unique academic publications were included in this analysis. Fig. 1 presents a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram showing the process of searching for and selecting the research articles.[21]

2.6. Data extraction

After the articles were selected, the data were extracted and recorded in an Excel spreadsheet. The extracted data were date of publication, language of publication, title of article, name of journal, author's country and affiliation, study design, targets of study, sample size, study setting, data collection instrument and key findings.

2.7. Data presentation

We use a descriptive approach to summarize the core study characteristics and key findings. Bar graphs were used to show the publication dates along with structured tables and figures to summarize the language of publication and the proportion of different study designs.

3. Results

3.1. Characteristics of the included studies

Among the 16 research articles included in the analysis, 50.0% of the publications ($n = 8$) were in Chinese, and 50.0% ($n = 8$) were in English. The majority of the articles ($n = 13$, 81.3%) were published by Chinese scholars, 12.5% ($n = 2$) were by scholars in the United States, and 6.3% ($n = 1$) were by scholars in Iran (Table 1).

As shown in Fig. 2A, academic publications were distributed across the following study designs: review, case report, observational study, RCT and nonrandomized clinical trial. Most of the papers ($n = 7$, 43.8%) were case reports, followed by observational studies ($n = 6$, 37.5%), while 6.3% ($n = 1$) were RCTs, 6.3% ($n = 1$) were reviews and 6.3% ($n = 1$) were nonrandomized clinical trials.

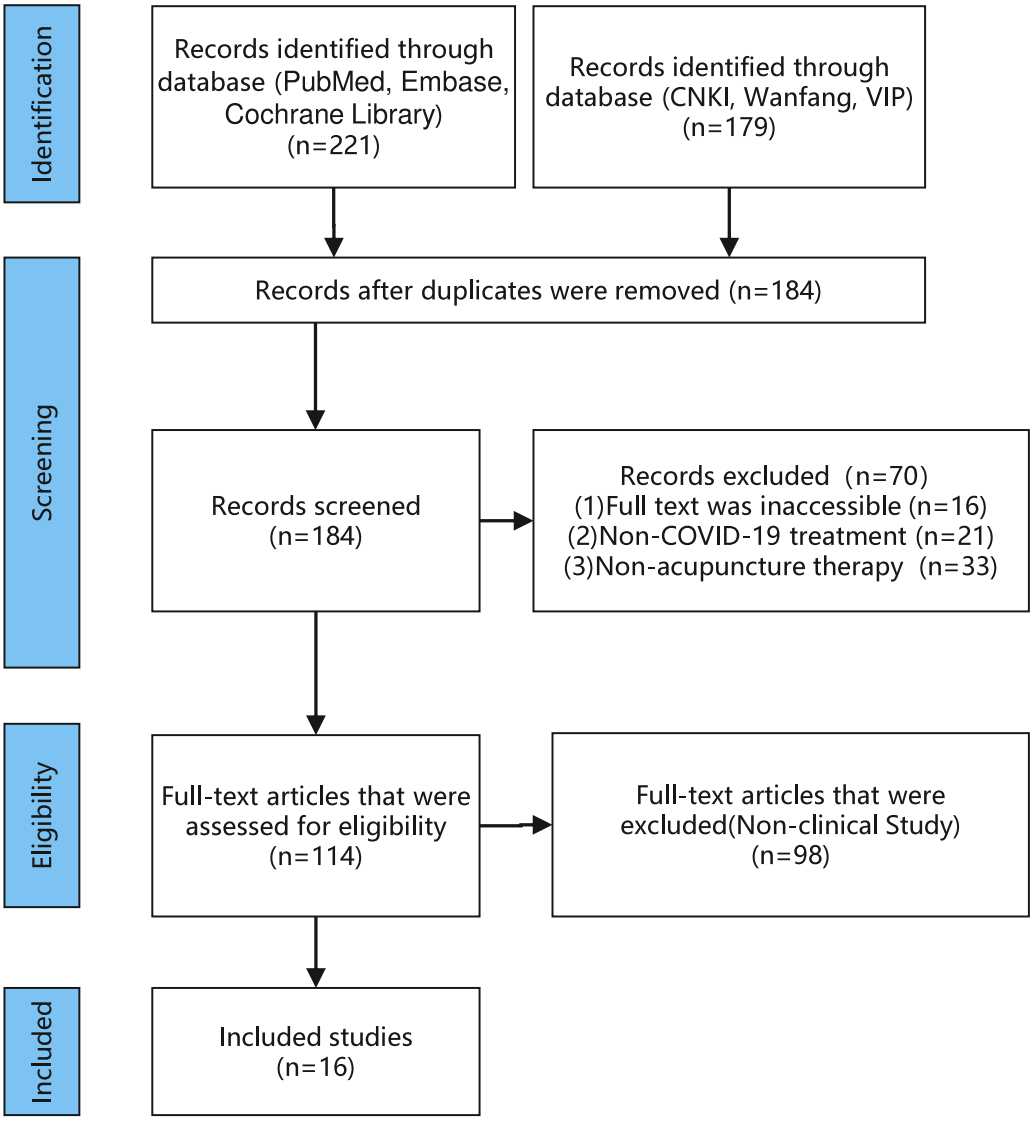

Fig. 1. PRISMA flow diagram for the scoping review process.

Table 1
Breakdown of study design by language.

Study Design	English literature		Chinese literature		Total	
	n	%	*n*	%	*n*	%
RCTs	0	0	1	6.3	1	6.3
Observational Studies	1	6.3	5	31.3	6	37.5
Case Reports	5	31.3	2	12.5	7	43.8
Nonrandomized clinical trials	1	6.3	0	0	1	6.3
Reviews	1	6.3	0	0	1	6.3
Total	8	50.0	8	50.0	16	100

In the first 3 months of 2020, no articles related to acupuncture treatment of COVID-19 were published. With the global outbreak of the COVID-19 pandemic, the number of articles continues to increase. Currently, there is still a trend of publishing almost 3 articles every quarter (Fig. 2B).

The summary of the 16 included articles is shown in Table 2.

3.2. Overview of the included RCTs

Guan et al. randomly divided 20 hospitalized patients with COVID-19 into a control group and an observation group with 10 cases each according to the different treatment measures.[22] The control group received symptomatic and supportive therapies, and the observation group was treated with ear acupressure and acupressure on the basis of symptomatic and supportive therapies. The CAT scale and symptoms of nausea and abdominal distension before and after treatment were compared. The results showed that after 7 days of treatment, compared with the control group, the observation group's respiratory symptoms improved ($P = 0.043$) and the observation group's symptoms of abdominal distension improved ($P = 0.01$). There was no statistically significant difference in nausea between the two groups ($P = 0.485$).

Guan concluded that ear acupressure and acupressure could help improve the respiratory symptoms and abdominal distension

Table 2
Summary of retrieved studies.

Study	Design/Patients	*N*	Age	Intervention/Comparison	Outcome	Main Results	Adverse events	Operations
Guan, 2020.[22]	RCT/ COVID-19 patients admitted to hospital	20	39-65	Conventional therapy with Ear Acupressure and Acupresure / Conventional therapy	COPD assessment test, Symptom self-rating scale	After treatment, the observation group's CAT scale score decreased and the respiratory system symptoms were improved compared with the control group ($P = 0.043$); the observation group had better improvement in abdominal distension than the control group ($P = 0.01$); the two groups had no statistical difference in nausea symptoms Learning significance ($P = 0.485$).	No adverse events report.	Ear Acupoints: Bilateral of Lung, Shenmen, Trachea, Spleen, Stomach. Acupoints: Bilateral of ST36, LI4, LI11and PC6. Press with the thumb, press for 3 minutes each time, TID.
Chen, 2021.[23]	Observational study/ COVID-19 patients admitted to hospital	7	NA	Conventional therapy with Acupuncture / NA	Olfactory Score, Symptoms	The olfactory scores of 7 patients after 3 times of acupuncture treatment were significantly higher than those before acupuncture treatment.	No adverse events report	Acupoints: Bilateral of DU14, DU20, GB20 and LI20. Needle-retaining time: 30 minutes. Number of interventions: QD.
Duan, 2020.[24]	Observational study/ COVID-19 patients admitted to hospital	60	29-86	Conventional therapy with Acupuncture / NA	Symptoms, Mortality and discharge rate	95% patient's clinical symptoms were significantly improved. 2 patients died of acute myocardial infarction, and 1 died of respiratory failure.	No adverse events report	Different acupoints are given according to the different clinical symptoms of patients, all the acupoints were selected bilaterally: Fever: SI3 and KI3; Cough: LU9 and RN22; Chest pain: LU9, KI3, GB34 and PC6; Shortness of breath: LU9 and RN22; Indigestion: HT7, SP6 and PC6; Constipation and Diarrhea:RN12, ST25, BL24, SI3 and KI3; Insomnia and Dizziness: HT7, SP6, and PC6. Needle-retaining time and number of interventions are not mentioned.
Liu, 2020.[25]	Observational study/ COVID-19 patients admitted to hospital	17	27-74	Conventional therapy with Acupuncture / NA	absorption of pulmonary infiltration and discharge rate	The imaging characteristics of 15 cases' absorption of pulmonary infiltration was significantly improved after treatment. One month later, 12 cases were discharged, 2 cases were transferred, and 1 case was still hospitalized.	No adverse events report	Acupoints: Bilateral acupoints of LU9, SP4 and ST36. Needle-retaining time and number of interventions are not mentioned.
Gong, 2021.[26]	Observational study/ COVID-19 patients admitted to hospital	33	13-84	Conventional therapy with Acupuncture / NA	Symptoms and discharge rate	All patient's clinical symptoms were significantly improved and all patients were cured and discharged.	No adverse events report	Acupoints: Bilateral of LU7, LI4, PC6, LI11, ST36 and LR3. Needle-retaining time: 30m. Number of interventions: Qod

(*continued on next page*)

Table 2 (*continued*)

Study	Design/Patients	*N*	Age	Intervention/Comparison	Outcome	Main Results	Adverse events	Operations
Zha, 2020.[27]	Observational study/ COVID-19 patients admitted to hospital	60	average age 54	Conventional therapy, Modified rehabilitation exercises and Acupressure / NA	Respiratory symptoms	The baseline prevalence for dry cough, productive cough, difficulty in expectoration, and dyspnea were 41.7%, 43.3%, 35.0%, and 50.0%, respectively. The pronounced decline in symptom prevalence was recorded over time. Four weeks after discharge, the author noticed a lower remission rate in productive cough and difficulty in expectoration.	No adverse events report	Acupoints: Bilateral of LU11, LU7 and Yuji. Number of interventions: BID.
Wang, 2020.[28]	Observational study/ COVID-19 patients admitted to hospital	93	18-84	Conventional therapy with Acupuncture or Ear acupuncture / Conventional therapy with traditional Chinese medicine	Discharge rate	Patients who received acupuncture treatment had a significantly shorter course of disease than patients who did not receive acupuncture treatment, and the length of hospital stay was shorter than that of patients who did not receive acupuncture treatment.	No adverse events report	NA
Yin, 2021.[29]	Case report/ A COVID-19 patients admitted to hospital	1	81	Conventional therapy with Acupuncture/ NA	Symptoms	After 9-day acupuncture treatment, the patient's shortness of breath, CT scan, blood tests showed significant improvement.	No adverse events report	Acupoints: Bilateral of KI3, Metabolic (Metabolic-point), and Zhichuan (Breathless-relief point). Needle-retaining time: 30s. Number of interventions: QD.
Tao, 2020.[30]	Case report/ A COVID-19 patient admitted to hospital	1	64	Acupuncture, Moxibustion and Chinese herbal granules/ NA	Symptoms	After 10-day treatment, the patient narrated that she was recovered and could have a daily activity, without shortness of breath and cough in the re-examination.	No adverse events report	Acupoints: Bilateral of KI3, Metabolic (Metabolic-point), and Zhichuan (Breathless-relief point). Needle-retaining time: 30s. Number of interventions: QD.
Gong, 2020.[31]	Case report/ Two COVID-19 patients admitted to hospital	1	81	Conventional therapy with Acupuncture/ NA	Symptoms	After treatment for 2 weeks, all of the clinical symptoms were significantly improved.	No adverse events report	Acupoints: Bilateral of ST36, SP6, LR3, LI4, PC6 and LI11. Needle-retaining time: 30m. Number of interventions: QD.

(*continued on next page*)

Table 2 (*continued*)

Study	Design/Patients	*N*	Age	Intervention/Comparison	Outcome	Main Results	Adverse events	Operations
		1	72	Conventional therapy with Acupuncture/ NA	Standing posture	The patient had been lying on the bed for over 1 month. In 7 days of treatment, the patient could stand up and 9 days later, she could walk without help.	No adverse events report	Acupoints: Bilateral of ST36, SP6, LR3, LI4, PC6 and LI11. Needle-retaining time: 30m. Number of interventions: QD.
Huang, 2021.[32]	Case report/ A COVID-19 patient in recovery stage	1	NA	Ear Acupuncture/ NA	Fatigue	The symptoms of fatigue were significantly reduced after 2 weeks of ear acupuncture treatment.	No adverse events report	Ear Acupoints: Bilateral of Lung, Spleen, Large intestine, Liver, Endocrine, Sympathy, Needle-retaining time: 15m. Number of interventions: BID.
Yeh, 2021.[33]	Case report/ A comatose COVID-19 patient.	1	73	Acupuncture/ NA	Consciousness, Blood leukocyte count, CRP	After 1 week of acupuncture treatment, the patient gradually regained consciousness, 2 weeks later	No adverse events report	Acupoints: The choice of acupupoints is different each time. All the acupoints were selected bilaterally 1st: GV20, ST34, ST39. 2nd: BL3, LI4, KI9. 3rd: BL7, ST40, KI9. 4th: BL2, ST39. 5th: GB14,LI4,LR5. 6th: GB13, LI4, ST40. 7th: EX-HN3 BL2, ST40. 8th: ST8, LI4, ST37 Needle-retaining time: 30m. Number of interventions: QD.
Boezaart, 2020.[34]	Case report/ Two COVID-19 patients admitted to hospital	1	60	Transcutaneous Auricular Vagus Nerve Stimulation/ NA	Interleukin-6 Blood Levels	After one week of treatment, his IL-6 dropped from 44.1 pg/mL to 7.8 pg/mL.	No adverse events report	The conchae of both ears were stimulated with a proprietary waveform, with the anode in one ear and the cathode in the other ear. The waveform delivers a 133-kHz decrescendo alternating current in bursts of 0.3 ms and 25 Hz. The taVNS application was initiated around 8:00 am every morning and lasted for 60 minutes per day.
		1	64	Transcutaneous Auricular Vagus Nerve Stimulation/ NA	Interleukin-6 Blood Levels	After ten days of treatment, his IL-6 dropped from 104.9 pg/mL to 36.1 pg/mL.	No adverse events report	

(*continued on next page*)

Table 2 (*continued*)

Study	Design/Patients	*N*	Age	Intervention/Comparison	Outcome	Main Results	Adverse events	Operations
Shi, 2021.[35]	Case report/ A COVID-19 patient admitted to hospital	1	72	Conventional therapy with Acupuncture/ NA	Symptoms	On admission, the patient had chest tightness, weakness in both lower limbs, inability to walk, anorexia, and irritability., the body temperature of patient was as high as 38.4°C. After 7 days of treatment, the patient can stand; the patient can walk with support for the next 2 days; after 14 days of treatment, the patient can walk alone. Other symptoms are all alleviated.	No adverse events report	Acupoints: Bilateral of LR3, ST36, SP6, BL62, KI6, PC6, LI4, LU7. Needle-retaining time: NA. Number of interventions: NA.
Thibaud, 2021.[36]	nonrandomized clinical trial/ patients with COVID-19	439	20-64	Preventive Natural Bioenergetics/ NA	Symptoms (Fever, Cough, Shortness of Breath)	Among people who choose to receive preventive NB COVID-19 treatment, the frequency and severity of the three main symptoms of COVID-19 are significantly lower than those of the general population. In this population, no one needs hospitalization, including the elderly, which can be explained as a very significant clinical improvement. Most people have not reported any side effects. Only minor side effects have been reported.	No adverse events report	A sugar pellet or a special tool containing specific frequencies with strengths comparable to those of homeopathic remedies was placed on CV6 point while touching endpoints of all meridians in a specific sequence. For the second part of the treatment, the specialist touched the large intestine and lung meridians endpoints (LI1 and LU11) on people's body while playing a sound file over people's thymus.
Badakhsh, 2021.[37]	Review	NA	NA	NA	NA	A total of 3 articles on acupuncture treatment of COVID-19 were included. These studies have shown that it reduces negative emotions, chest pain, and improves appetite levels of COVID-19 patients.	NA	NA

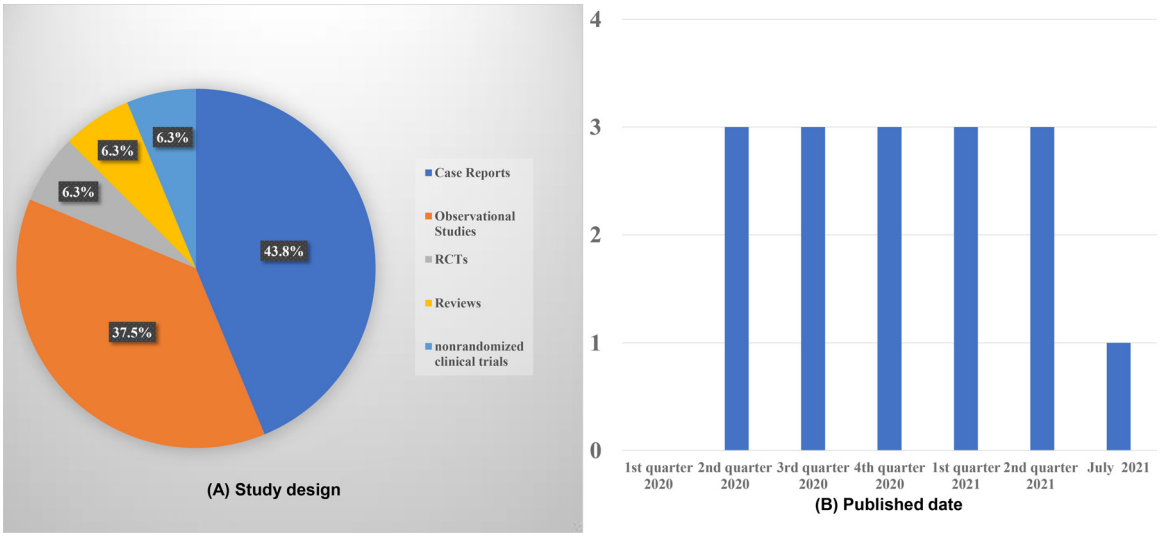

Fig. 2. Type of published articles. (A) Study designs; (B) Publication dates.

of COVID-19 patients, whose curative effect is better than simple symptomatic treatment.

3.3. Overview of the included observational studies

Six observational studies included in this review investigated the role of acupuncture in treating COVID-19 patients admitted to hospitals.

Chen et al. performed acupuncture on 22 hospitalized patients diagnosed with COVID-19 and olfactory disorders.[23] A self-developed simple olfactory quantitative score table was used for scoring before and after treatment. The results suggested that the olfactory function score of patients on the 11th day of admission was higher than that on the first day of admission. Among them, 7 patients had significantly higher olfactory scores after 3 acupuncture treatments.

(1) Duan et al. administered acupuncture treatment to 60 hospitalized patients with COVID-19.[24] Based on the different symptoms of these patients, the selected acupoints were different. Among the 60 patients, 3 died, 2 died of acute myocardial infarction, and 1 died of respiratory failure. The remaining patients' clinical symptoms improved significantly after acupuncture treatment and met the discharge standards.
(2) Liu et al. observed the effect of acupuncture treatment on the clinical symptoms of 17 patients with new coronavirus pneumonia.[25] After admission, X-ray examination showed that all patients presented with ground-glass opacity, 11 patients with partial consolidation and 10 with interstitial changes. After treatment, 15 cases showed obvious improvements on lung imaging. One month later, 12 patients were discharged, 2 patients were transferred, and 1 patient was still hospitalized.
(3) Gong et al. studied 33 patients at Wuhan Leishenshan Hospital.[26] Some patients had fever, dry cough, chest distress, chest pain, fatigue, palpitation, anxiety, tension, irritability, poor appetite, insomnia, depression and other symptoms. After several acupuncture treatments, all 33 patients were cured and discharged, and the symptoms mentioned above were significantly improved.
(4) Zha et al. enrolled 60 confirmed COVID-19 cases with a median age of 54 years old.[27] During hospitalization, the patients needed to perform modified rehabilitation exercises (retrieved from Chinese martial art Eight-section Brocade) and acupressure twice a day. Zha prospectively gathered the patient-reported outcomes concerning respiration-related symptoms at admission and at the time of hospital discharge. The results show that the respiratory-related symptoms of the COVID-19 patients improved significantly during hospitalization.
(5) Wang et al. observed the effect of acupuncture treatment on the clinical symptoms of admitted patients with COVID-19.[28] The main symptoms of these patients upon admission include fatigue and anxiety, depression, dry cough, sleep disturbance, irritability, indigestion and muscle aches. All 93 patients received conventional treatment, 41.94% of them also received acupuncture treatment, and 12.90% received auricular acupuncture treatment. The results showed that patients who received acupuncture treatment had a significantly shorter course of disease than patients who did not receive acupuncture treatment, and their length of hospital stay was shorter than that of patients who did not receive acupuncture treatment.

3.4. Overview of the included case reports

Seven case reports were retrieved and assessed in this review.

(1) The first case report was an 81-year-old COVID pneumonia patient.[29] She was transferred to Wuhan Leishanshan Hospital due to her worsening condition. The patient's breath rate, SpO2, heart rate, neutrophil/lymphocyte ratio (NLR), monocyte/lymphocyte ratio (MLR), C-reactive protein (CRP) level, and chest computed tomography were monitored. Acupuncture treatment was performed on-site on admission Day 1, and showed immediate effectiveness for her breath rate, SpO2, and heart rate. After 9 days of treatment, the patient's shortness of breath, CT scan, and blood tests showed significant improvement. Yin reported that acupuncture, as an adjuvant to standard care, might achieve better results in treating severe cases of COVID-19.
(2) The second case report was a 64-year-old female patient.[30] After receiving symptomatic treatment and medication treatment, such as oseltamivir, her symptoms remained, and her shortness of breath was not obviously relieved. Then the patient was treated with acupuncture, moxibustion and Chinese herbal granules at Leishenshan Hospital. Three days later, her shortness of breath on exertion was relieved. After 10 days of treatment, the patient reported that she had recovered and could have daily activity without shortness of breath or coughing. Tao

indicated that acupuncture therapy has an active adjuvant effect during COVID-19 treatment.

(3) Two cases of coronavirus disease 2019 were reported in the third article.[31] On admission, a 81-year-old female patient had the oxygen saturation of 69% and her symptoms were low spirits, fever, cough, chest oppression, shortness of breath, and poor sleep. After treatment for 2 weeks, all of these symptoms were relieved. A 72-year-old female patient on admission had been bed ridden for over 1 month and had cough, poor appetite, and chest pain. After 7 days of treatment, the patient could stand up and 9 days later, she could walk without help.

(4) The fourth case report was COVID-19 pneumonia patient in the recovery period.[32] In this period, ear acupuncture treatment was performed on the patient to adjust the function of the viscera. Fatigue symptoms were significantly reduced after 2 weeks of ear acupuncture treatment.

(5) Yeh et al. reported a 73-year-old male patient who was hospitalized due to worsening COVID-19 pneumonia and underwent tracheostomy.[33] This patient had a history of hyperlipidemia and abdominal bleeding. Twenty-nine days after admission, the patient had symptoms of coma, and acupuncture treatment was started on the 5th day thereafter. After 1 week of acupuncture treatment, the patient gradually regained consciousness. After 3 weeks of acupuncture treatment, he could perform simple body movements in response to verbal commands.

(6) Boezaart et al. reported two male patients with COVID-19: one was 60 years old and the other was 64 years old.[34] On the 8th day of admission, the first patient developed severe cough, fever, and shortness of breath. His blood oxygen saturation reached 94%, and his IL-6 blood level was 76.4 pg/mL. The second patient developed flu-like symptoms on the 7th day of admission. His blood oxygen saturation was 93% and his IL-6 blood level was 104.9 pg/mL. After that, both patients received transcutaneous auricular vagus nerve stimulation treatment. After 7 days of treatment, the IL-6 blood levels of both patients decreased significantly.

(7) The seventh case was a 72-year-old COVID-19 pneumonia female patient.[35] The patient's body temperature was 38.4°C at the time of admission. She also suffered from chest tightness and weakness of both lower limbs. After 7 days of acupuncture treatment, the patient's symptoms improved significantly; 14 days later, the patient could walk independently.

3.5. Overview of the included nonrandomized clinical trials

Thibaud E d'Oultremont assessed whether preventive natural bioenergetics (NB) could reduce the severity of the main symptoms (fever, cough, and shortness of breath) in patients with COVID-19.[36] Preventive natural bioenergetics (NB) is a procedure based on double acupuncture meridian that uses specific substances and sounds to stimulate acupoints to activate the immune system. A total of 439 people voluntarily accepted preventive natural bioenergetics. The frequency and severity of the main symptoms of COVID-19 (fever, cough, and shortness of breath) in these people were compared with the general population. The results showed that compared with the general population, the frequency and severity of the main symptoms of COVID-19 in the population who chose to receive preventive NB COVID-19 treatment was significantly reduced ($P < 0.01$). Only minor side effects were reported.

3.6. Overview of the included reviews

Badakhsh et al. conducted a systematic review on complementary and alternative medicine therapies and COVID-19.[37] The systematic review included 14 studies, but only 3 articles related to acupuncture. The conclusion was that acupuncture can reduce the negative emotions and chest pain of COVID-19 patients, and significantly improve their appetite level. Since these 3 articles are included in our scoping review, a detailed overview will not be provided here.

4. Discussion

This study shows a holistic picture of the current research in response to acupuncture treatment for COVID-19. The included articles suggest that acupuncture can alleviate the symptoms of the patients and shorten their hospitalization stays, and that it is effective for elderly individuals and children infected with COVID-19. In addition, acupuncture for COVID-19 has many advantages and disadvantages in the process of the treatment. The specific content is summarized as follows.

4.1. Analysis of research implementation country

At present, acupuncture has made great contributions to China's fight against the COVID-19 epidemic and the China Association of Acupuncture-Moxibustion published the Guidance for Acupuncture and Moxibustion Interventions on COVID-19 (second edition) on March 1, 2020.[38] Under the advocacy of the Chinese government, Chinese clinicians have widely used acupuncture to treat COVID-19 and have published multiple clinical research papers analyzing the efficacy and safety of acupuncture for the treatment of COVID-19.

However, our research found that of the 16 included studies, 13 studies were implemented in China, and only three studies were conducted in non-Chinese regions. This shows that acupuncture treatment of COVID-19 has not been widely used in non-China regions. This is most likely because acupuncture encounters many obstacles outside of China. LI Y.M., a member of the American TCM Society, conducted a detailed analysis of this obstacle in the United States. The main obstacle is that the majority of acupuncturists in the United States are not hospital staffs, and most of them practice medicine in private clinics. However, patients with COVID-19 mainly receive treatment in the hospital, which limits the opportunities for acupuncturists to provide treatment for these patients. In addition, the acupuncture laws of some states have clear legal regulations on the scope of medical practice for acupuncturists, and these regulations do not explicitly include acute infectious diseases and epidemics, which means that the treatment of COVID-19 is not included in the scope of acupuncturists' medical practice. Professional license restrictions; not covered by medical malpractice insurance and lack of supporting evidence are the other reasons hindering the spread of acupuncture treatment for COVID-19 out of China.[39]

4.2. Acupoints selection

Among the 16 articles included in our scoping review, 13 articles give details about the specific selection of acupoints for the acupuncture treatment of COVID-19. The selection of acupoints in 11 studies was fixed. In one study, different acupuncture points were selected according to the patient's symptoms, while in another study, different acupuncture points were selected on different dates. A statistical analysis of the selection of acupoints was conducted in this scoping review and the results show that the most frequently used acupoints were LI4, PC6, ST36 and KI3. The specific results are shown in Fig.3.

LI4 is the *yuan-primary point* of the *large intestine meridian of hand-yangming* which has an exterior-interior relationship with the lung meridian. TCM thinks LI4 has the effect of dispersing wind, eliminating the exterior, clearing the lung, harmonizing the stomach and stopping pain, which helps restore lung function, and relieves symptoms of dry cough and dyspnea.

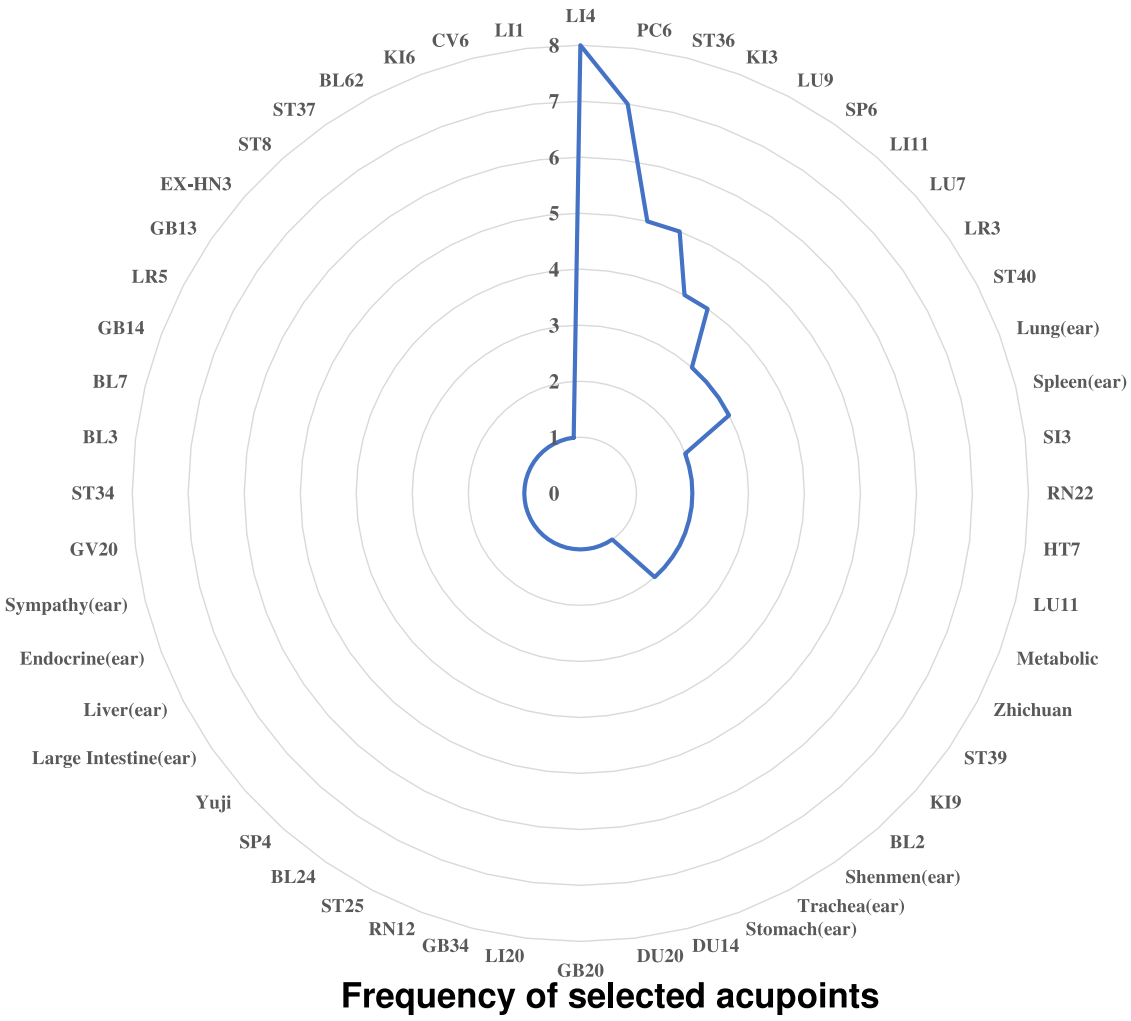

Fig. 3. The Frequency of selected acupoints.

PC6 is a key point on *the pericardium meridian of hand-jueyin*. TCM thinks the pericardium has a very close relationship with the heart, which means that PC6 can relieve symptoms of chest tightness and chest pain. PC6 is also one of the eight confluent points. According to the theory of TCM, PC6 has a certain relationship with the stomach and can relieve symptoms of vomiting and stomachache.

ST36 is the *he-sea point* on the *stomach meridian of foot-yangming*. TCM thinks ST36 has the effect of strengthening the spleen and harmonizing the stomach, which helps relieve symptoms of vomiting, diarrhea, and constipation, and can enhance immunity.

TCM suggests that "the lung is the host of qi and the kidney is the root of qi" which means that the kidney also affects the respiratory function of the lungs. KI3, the *yuan-primary point* of the *kidney meridian of foot-shaoyin*, acts to tonify the primary *qi*, strengthen yang for water metabolism, and receive *qi* to relieve asthmatic breathing, which helps restore the function of the patient's lungs and relieve symptoms of dyspnea.

4.3. Efficacy of acupuncture in the treatment of COVID-19

In general, the clinical manifestations of COVID-19 include myalgia, fatigue, dry cough, dyspnea and fever. Some patients will also experience abdominal pain, headache, diarrhea and sore throat.[40] The included studies show that acupuncture has a good effect in improving the above symptoms of COVID patients. After acupuncture treatment, symptoms such as dysosmia, dry throat, cough, diarrhea, fever, nausea and vomiting were greatly alleviated or even disappeared. In addition, the included studies also indicate that acupuncture in advance can reduce the frequency and severity of the main symptoms of COVID-19.

Previous research has shown that the elderly population is more susceptible to COVID-19 and has a higher mortality rate, especially elderly patients with pre-existing diseases (cirrhosis, hypertension, coronary heart disease, diabetes, and Parkinson's disease).[41] In our scoping review, all patients included in the case reports were elderly people over 60 years old. One of the elderly individuals had a history of hyperlipidemia and cerebral hemorrhage. Before receiving acupuncture treatment, some elderly people had severe COVID-19 symptoms, such as the inability to walk and coma. In addition, CT scans and blood tests also showed that some patients were very sick. After these elderly COVID-19 patients received acupuncture treatment, these case reports all indicated that these patients' conditions were greatly improved.

None of the studies reported any side effects, suggesting that acupuncture is safe for treating COVID-19.

4.4. Obstacles in the process of acupuncture treatment of COVID-19

Compared with the advantages of acupuncture in the treatment of COVID-19, its disadvantages require more attention. It is well-

known that SARS-CoV-2 is a highly contagious virus, but acupuncturists need to be in close contact with COVID-19 patients to perform acupuncture operations, which places acupuncturists in a very dangerous situation. If acupuncturists wear personal protective equipment (PPE) to implement acupuncture treatments, such equipment will hinder the acupuncturist from precisely placing the acupuncture needle into the acupoints on patients' bodies.[42] This may be the reason for primary use of ear acupressure or acupressure in some studies, because these two treatment methods do not require acupuncture needles, and patients can perform the procedure themselves. The doctor only needs to provide guidance, which reduces the possibility of virus transmission to the doctor.

4.5. Limitations of the included studies

Although the included studies suggest that acupuncture is very promising for the treatment of COVID-19, most acupuncture therapies were not used alone for the treatment. Acupuncture is often used together with herbal medicine, moxibustion, Western medicine and other measures to treat COVID-19. Therefore, we cannot simply attribute all of the good results to acupuncture.

In addition, most of the included studies were observational studies and case reports, and there was a lack of high-quality level I and level II studies evaluating acupuncture therapies in relation to COVID-19.

Moreover, many included studies had no specific descriptions of the angle and depth of acupuncture, time of acupuncture operation, or whether hand-manipulation of the needle was performed, which are all important parts of the acupuncture process.

4.6. Suggestions for future research

(1) Describe in detail the operation process of acupuncture treatment in treating COVID-19, and conduct research on the operation process to determine the best operation plan.
(2) Implement high-quality level I and level II research to provide high-quality evidence for acupuncture treatment of COVID-19.
(3) Explore the effect of acupuncture on the prevention of COVID-19.

4.7. Strengths

This research summarizes the main results of the retrieved studies and suggests some evidence for future research directions on acupuncture treatment of COVID-19, which will provide information for the research community and health professionals to adjust and/or develop new research and practices.

4.8. Limitations

The intention of a scoping review is simply to summarize the breadth of the available literature, and it refrains from assessing the quality of the studies. Most of the studies retrieved in this review had important limitations including the use of small population samples and simple comparisons. Additionally, papers in languages other than English and Chinese were excluded.

4.9. Conclusions

Acupuncture can relieve the symptoms of COVID-19 patients, shorten the length of hospital stay, and is effective for elderly patients with serious illnesses. However, there is a lack of high-quality level I and level II studies. Coupled with the difficulties that acupuncturists faced during the process of treatment, the promotion of acupuncture treatment for COVID-19 still faces many obstacles.

Ethical statement

No ethical approval was required as this study did not involve human participants or laboratory animals.

Data availability

The data that support the findings of this study are available within the article.

Conflict of interest

The authors declare no conflict of interest.

Funding

None.

Author contributions

Conceptualization: J. Zeng. Methodology: L. Lu. Software: J. Zhan. Formal analysis: H. Wen, X. Wei. Resources: L. Ding. Data curation: C. Tao, C. Li. Visualization: P. Zhang, Y. Tang. Writing – Original Draft: C. Chen. Writing – Review and Editing: J. Zeng and L. Lu.

Supplementary materials

Supplementary material associated with this article can be found in the online version, at doi:10.1016/j.imr.2021.100801.

References

1. Zhu N, Zhang D, Wang W, et al. A Novel Coronavirus from Patients with Pneumonia in China, 2019. *N Engl J Med*. 2020;382(8).
2. WHO.. *Statement on the Second Meeting of the International Health Regulations (2005) Emergency Committee Regarding the Outbreak of Novel Coronavirus (2019-nCoV)*; 2020 *https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov)* Published 2020. Accessed July 31, 2021.
3. Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU). COVID-19 Dashboard. https://www.arcgis.com/apps/dashboards/bda7594740fd40299423467b48e9ecf6. Published 2020. Accessed July 31, 2021.
4. Ramezani M, Simani L, Karimialavijeh E, et al. The role of anxiety and cortisol in outcomes of patients with Covid-19. *Basic Clin Neurosci*. 2020;11:179–184.
5. Rio C D, Malani P N. COVID-19—new insights on a rapidly changing epidemic. *JAMA*. 2020;323(14).
6. Bai Y, Yao L, Wei T, et al. Presumed asymptomatic carrier transmission of COVID-19. *JAMA*. 2020;323(14).
7. Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet North Am Ed*. 2020;395(10223).
8. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet North Am Ed*. 2020;395(10223).
9. Suzuki M, Yokoyama Y, Yamazaki H. Research into acupuncture for respiratory disease in japan: a systematic review. *J Acupunct Tuina Sci*. 2009;27(6):331.
10. Trott P V, Oei S L, Ramsenthaler C. Acupuncture for breathlessness in advanced diseases: a systematic review and meta-analysis. *J Pain Symptom Manage*. 2019;59(2).
11. Cheong KB, Zhang JP, Huang Y, et al. The effectiveness of acupuncture in prevention and treatment of postoperative nausea and vomiting: a systematic review and meta-analysis. *PLoS One*. 2013;8:e82474.
12. Zhang Y, Lin L, Li H, et al. Effects of acupuncture on cancer-related fatigue: a meta-analysis. *Support Care Cancer*. 2018;26:415–425.
13. Lee SH, Lim SM. Acupuncture for insomnia after stroke: a systematic review and meta-analysis. *BMC Compl Altern Med*. 2016;16:228.
14. Amorim D, Amado J, Brito I, et al. Acupuncture and electroacupuncture for anxiety disorders: a systematic review of the clinical research. *Compl Ther Clin Pract*. 2018;31:31–37.
15. Kaptchuk TJ. Acupuncture: theory, efficacy, and practice. *Ann Intern Med March*. 2002;136:374–383.
16. Liu H, Wang L, Xuan Y. The preliminary research on 89 cases of SARS in rehabil itation clinic. *Chin Acupunct Moxibust*. 2003.
17. China Association of Acupuncture and Moxibustion. *Notice on Issuing Guidance for Acupuncture and Moxibustion Intervention on COVID-19 (Second edition)*; July 31, 2021 *http://www.caam.cn/article/2193* Published 2020. Accessed.

18. Liu W H, Guo S N, Wang F, et al. Understanding of Guidance for acupuncture and moxibustion interventions on COVID-19 (Second edition) issued by China Association of Acupuncture-Moxibustion. *World J Acupunct Moxibust*. 2020;30(1).
19. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Social Res Methodol*. 2005;8(1):19–32.
20. World Health Organization. *WHO International Standard Terminologies on Traditional Medicine in the Western Pacific Region*. Regional Office for the Western Pacific. World Health Organization, Western Pacific Region; 2007.
21. Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med*. 2009;6.
22. Guan L, Liu N, Man N, et al. The effect of ear acupressure combined with acupressure on the clinical symptoms of patients with severe COVID-19 (in Chinese). *Beijing Tradition Chin Med*. 2020;39(11):1166–1168.
23. Chen S S, Shi J, Yang Z G, et al. Analysis of TCM clinical characteristics of 22 patients with novel coronavirus pneumonia complicated with olfactory dysfunction (in Chinese). *J Liaoning Univ Tradition Chin Med*. 2021:1–10. [2021-08-23]. http://kns.cnki.net/kcms/detail/21.1543.R.20210604.1505.004.html .
24. Duan Y S, Zhu C Y, Wu P P, et al. Sixty cases of COVID-19 treated with integrated Chinese and western medicine nursing (in Chinese). *Henan Tradition Chin Med*. 2020;40(07):990–993.
25. Liu X, Qiao S B. Preliminary analysis of clinical characteristics and curative effect of 17 cases of novel coronavirus pneumonia treated by integrated traditional Chinese and Western medicine (in Chinese). *Asia-Pac Tradition Med*. 2020;16(06):1–5.
26. Gong Y B, Si X J, Zhang Y. Clinical application and practice of acupuncture therapy in new coronavirus pneumonia (in Chinese). *Chin Acupunct Moxibust*. 2021;41(02):142–144.
27. Zha L, Xu X, Wang D, et al. Modified rehabilitation exercises for mild cases of COVID-19. *Ann Palliat Med*. 2020;9(6):17.
28. Wang R P, Li X, Wang Z W, et al. Analysis of clinical features, course of disease and hospitalization days of COVID-19 patients receiving TCM treatment (in Chinese). *Shanghai J Tradition Chin Med*. 2020;54(08):25–30.
29. Yin X, Cai S B, Tao L T, et al. Recovery of a patient with severe COVID-19 by acupuncture and Chinese herbal medicine adjuvant to standard care. *J Integrat Med*. 2021;5.
30. Tao LT, Huang TL, Zheng DW, Zou X, et al. Case of professor Xu ZOU's acupuncture technique for "benefiting kidney and strengthening anti-pathogenic qi" in promoting the absorption of COVID-19. *World JAcupunct Moxibust*. 2020;30(3):167–170.
31. Gong YB, Yang ZL, Liu Y, et al. Two cases of corona virus disease 2019 (COVID-19) treated with the combination of acupuncture and medication in bedridden patients. *World J Acupunct Moxibust*. 2020;30(3).
32. Huang L L, Chen M Y, Tao W J, et al. TCM health management plan and case analysis during the recovery period of new coronavirus pneumonia (in Chinese). *Fujian J Tradition Chin Med*. 2020;51(04):4–7.
33. Yeh B Y, Chen Y L, Chang S A, et al. Acupuncture helps to regain the consciousness of a COVID-19 patient complicated with hypoxic-ischemic encephalopathy: a case report. *Neurol Sci*. 2021;42(11).
34. Boezaart AP, Botha DA. Treatment of Stage 3 COVID-19 with transcutaneous auricular vagus nerve stimulation drastically reduces interleukin-6 blood levels: a report on two cases. *Neuromodulation*. 2020.
35. Shi X J, Gong Y B, Zhang Y, et al. In the negative pressure ward practice and experience of tube acupuncture in the treatment of new coronavirus pneumonia. *Shanghai J Acupunct*. 2021;40(04):487–490.
36. d'Oultremont TE. People who chose the preventive natural bioenergetics (NB) COVID-19 treatment safely experienced a significant reduction of COVID-19 symptoms compared to the general population. *Cureus*. 2021;13(7).
37. Badakhsh M, Dastras M, Sarchahi Z, et al. Complementary and alternative medicine therapies and COVID-19: a systematic review. *Rev Environ Health*. 2021;37.
38. China Association of Acupuncture and Moxibustion. *Guidelines on Acupuncture and Moxibustion Intervention for COVID-19*. 2nd ed; June5, 2020 Online document at https://exploreimuclaedu/wp-content/uploads/Guidelines-on-Acupuncture-and-Moxibustion-Intervention-for-COVID-19-second-edition-with-logopdf.
39. Li Y M. Obstacles and opportunities for traditional Chinese medicine's participation in anti-epidemic in the United States. *World Chin Med*. 2020;15(10):1509–1512.
40. Del Rio C, Malani PN. COVID-19-new insights on a rapidly changing epidemic. *JAMA*. 2020.
41. Niu S, Tian S, Lou J, et al. Clinical characteristics of older patients infected with COVID-19: a descriptive study. *Arch Gerontol Geriatr*. 2020;89.
42. Liu WH, Guo SN, Wang F, Hao Y. Understanding of guidance for acupuncture and moxibustion interventions on COVID-19 (Second edition) issued by CAAM. *World J Acupunct Moxibust*. 2020; Mar;30(1):1–4.