Review Article

Vol. 12, No. 2, 72-82
https://doi.org/10.15280/jlm.2022.12.2.72

Journal of Lifestyle Medicine

Recent Advances in Chest Rehabilitation during COVID-19 Outbreak: A Systematic Review

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Background: The current COVID-19 pandemic has brought the entire world to a halt, resulting in illness, death, and changes in individual roles. Physical therapy and chest rehabilitation play a critical role following aftermath of pandemics.

Methods: PubMed, Google Scholar, PEDro, MEDLINE were searched for randomized controlled trials. Methodological quality was assessed independently by two authors using PEDro scale. Data for disability, chest physical functions and adverse effects were analyzed.

Results: A meta-analysis was not possible due to the heterogeneity of the studies included for review. After applying the studies' inclusion and exclusion criteria, a total of eight articles with 420 patients were included in the study for their detailed analysis. Two independent authors verified and screened the data, with the third author double-checked and searched for additional articles.

Conclusion: Findings revealed that chest rehabilitation approaches influence the clinical condition of people during COVID-19 outbreak resulting in improved condition stabilization and recovery, the consequent reduction in hospitalization period and improved health-related quality of life.

Key Words: COVID-19, Pandemic, Physical functional performance, Exercise, Quality of life, Hospitalization

INTRODUCTION

Coronavirus disease 2019 (COVID-19) lead the world to a situation that forces the governments to ban social gathering, limit interactions to reduce the spread of infection. As this infection is communicable and easily spread by the air droplets and with the contact to the infected individual [1]. Coronavirus is regarded as a novel virus that belongs to the beta-coronavirus family [2]. Coronavirus attacks on the lungs of human beings lead to exudation of fibrin and formation of the hyaline membrane in the alveoli. The life span of the corona virus in the human body is near about 96 hours [3]. Coronavirus infection is associated with diseases of the lungs that leading to complications of the respiratory system [1].

After the virus enters the human body the most common symptoms that will occur after 1 week are hypoxemia and dyspnoea. In severe cases of COVID-19 patients developed septic shock and acute respiratory distress syndrome [2]. Individuals suffering from COVID-19 are at high risk to de-

Received: April 10, 2022, Accepted: May 2, 2022

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velop fear, anxiety, restlessness, and sleep disturbances [4]. Thus, to overcome these associated secondary symptoms people are suggested relaxation exercises, yoga, breathing exercises [5].

Respiratory rehabilitation is effective to improve the breathing capacity, lung functions quality of life, activity of daily living in elderly patients of COVID-19 and those who progress to COPD after COVID-19 [3]. The objective of this systematic review is to analyse the overall certainty of evidence regarding the effectiveness of exercise treatment, as well as novel emerging chest rehabilitation approaches during COVID-19 outbreak.

METHODS

The review is registered with PROSPERO International prospective register of systematic reviews (CRD42022315359) and SWiM (Synthesis without Meta-Analyses) checklist was used to perform the current systematic review of the literature. Decs (Descriptors of Science and Health) and MeSH (Medical Subject Headings) were used to establish the search strategy; the same descriptors were found, and the articles were found by matching the descriptors using the Boolean operators AND and OR. The papers were identified using the keywords or expressions: “COVID-19” OR “Chest Physiotherapy” OR “Coronavirus” OR “Rehabilitation” OR “Exercises” OR “Physical therapy” OR “Active cycle of breathing techniques” OR “Chest rehabilitation advances” The search was conducted between December 2019 and October 2021 in following databases: PubMed, Google Scholar, PEDro, MEDLINE.

1. Eligibility criteria

Inclusion criteria: 1) Studies published during COVID-19 outbreak regarding rehabilitation. 2) People of both genders. 3) Studies that included rehabilitative exercises and tele-rehabilitation for individuals during COVID-19 outbreak. 4) Researches involving human general population, as well as healthcare professional groups.

Exclusion Criteria 1) Studies with pregnant women as their subjects 2) Studies in with metastatic illnesses, neonates and individuals with neurological problems are all excluded. 3) Studies without focus on rehabilitative exercises as an intervention program. 4) Narrative reviews, modelling studies, opinions, letters, news, editorials, viewpoints, commentaries and articles lacking relevant data, including grey literature were excluded from present review.

2. Selection of articles

Two reviewers (SA and VS) independently screened and analyzed titles and abstracts obtained from the searches for eligibility against the established inclusion criteria (PICOS). All titles and abstracts that met the inclusion criteria were extracted in full text. To determine eligibility, three independent reviewers (SA, CA and GR) read the full-text papers. The consensus was used to resolve disagreements among reviewers.

3. Data Extraction

Reviewer (AS) extracted data from the included papers, while another (SV, RG, AC) double-checked the results. At the RCT level, authors double-checked all point estimates. Authors only collected data from patients who have undergone any chest rehabilitation exercises or have received chest physiotherapy. To enable an overall estimate of the evidence, each conclusion of RCT on which this conclusion was founded was extracted.

4. Synthesis of results

The PEDro scale, which can be found at http://www.pedro.fhs.usyd.edu.au was used to assess the internal validity of the selected publications. PEDro is a database dedicated to studies that look into the effectiveness of physical therapy interventions. 11-item measure was created to evaluate the reliability and methodological quality of randomized clinical trials. If an item has been considered, a score of “1” should be awarded to it as a positive response, and a “0” should be assigned if it has not a negative response. The aggregate of all positive responses yields the final score. Each good response is worth one point, minus the first item, which is different from the others because it is connected to the study’s external validity. As a result, the scale score ranges from 0 to 10. Because of discrepancies in the outcome measures employed, the kind of statistical analysis utilised, and the limitations of accounting for confounders, a meta-analysis of results was not possible in this study.

RESULTS

Initially, 782,919 scientific publications were discovered in databases, with an additional three discovered through secondary searches in other sources. After applying the filters (year of publication, randomized controlled trial, and clinical trial), a total of 10,092 articles were found. 4,926 papers were eliminated after availing free full-text articles, and 2,931 articles were removed because their titles and abstracts did not link COVID-19 to chest rehabilitation procedures. A total of 129 articles were subjected to a summary analysis. Of these, 67 publications were removed following wrong publication type, 21 due to wrong study design, 09 studies following inappropriate outcomes, 13 articles were non-specific protocol, 07 articles had insufficient methodology with incomplete reporting of results and 04 articles were with outstead of inclusion criteria. Resulting in eight articles for this review, as shown in Fig. 1.

Tables 1 and 2 describe the organization and tabulation of the data extracted from the eight articles based on the following characteristics: authors, year of publication, study population and design (Table 1), objectives, assessment instruments, and main findings (Table 2), and Methodological analysis of the studies (Table 3).

1. Characteristics of included studies and outcomes

Two respiratory treatment techniques were tested for home isolated COVID-19 patients using a recently developed Telemanagement health care system in a study by Aya Sedky and colleagues. A total of 60 patients were split into two groups: A and B. Patients in Group A were given oxygen therapy by bilevel positive airway pressure while those

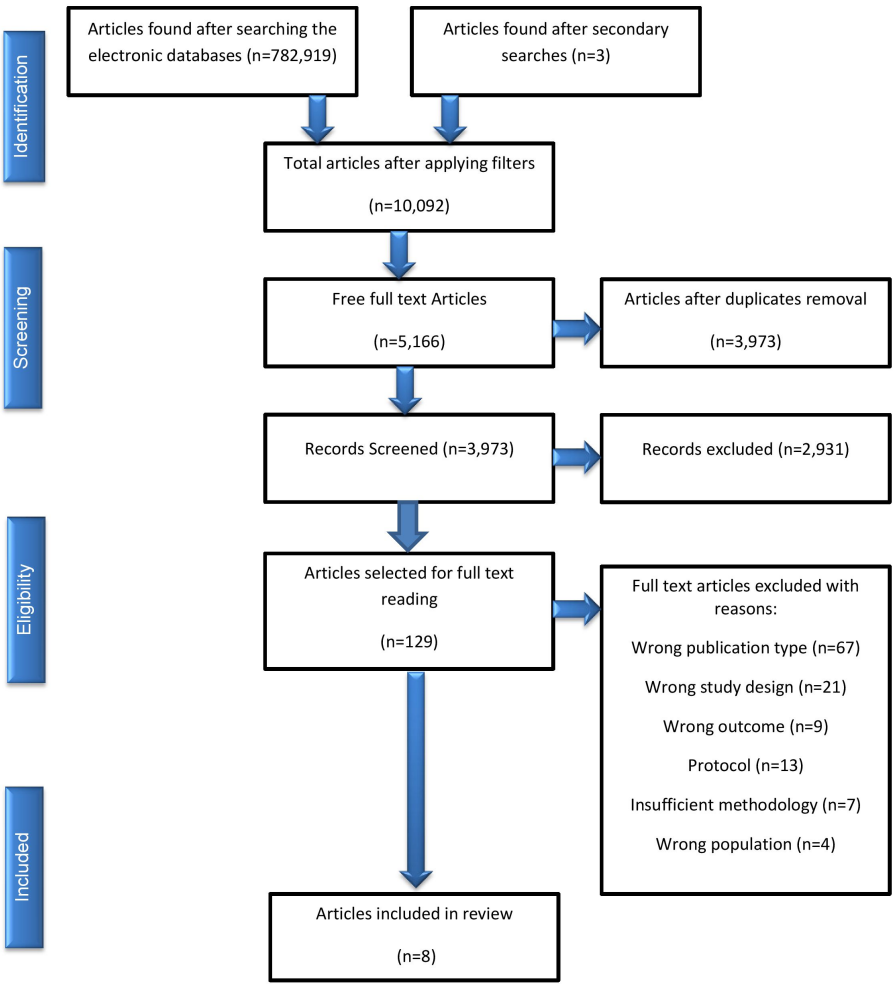

Fig. 1. Flow chart for selecting studies for review.

Table 1. Demographic characteristics of articles that address the use of the chest rehabilitation techniques in COVID-19 (2019-2021)

Author (year)	Country	Research outline	Total participants (males, females)	Age (years)*	Time of assessment
Sedky et al. (2021)	Egypt	Single-blinded randomized clinical trial	60 (22, 38)	38 ± 5.8	Post complete treatment sessions.
Gonzalez-Gerez et al. (2021)	Spain	Randomized, controlled, parallel, double-blind, two-arm clinical trial	38	IG: 40.79 ± 9.84 CG: 40.32 ± 12.53	Pre and post-exercise intervention
Özlü et al. (2021)	Turkey	Experimental study	67 (37, 30)	36.48 ± 11.63	Pre and post-exercise intervention
Xiao et al. (2020)	China	Clinical observational study	79	IG: 58.45 ± 11.08 CG: 59.33 ± 12.19	Pre and post-intervention
Liu et al. (2020)	China	The observational, prospective, quasi-experimental study	72	IG: 69.4 ± 8.0 CG: 68.9 ± 7.9	Pre and post-intervention
Vitale et al. (2020)	Italy	Randomized-controlled study	14	IG: 66 ± 4 CG: 71 ± 9	Pre and post-intervention
Shukla et al. (2020)	India	Online randomized study	60	AVP: 2.13 ± 1.06 KBP: 21.9 ± 0.90 DBE: 21.47 ± 0.64 PLB: 23.06 ± 2.79	Pre and post-intervention
Mohamed et al. (2021)	Turkey	Randomized controlled study	30	IG: 44.56 ± 4.25 CG: 35.25 ± 3.96	Pre and post-intervention

*Mean ± SD
IG: interventional group, CG: control group, AVP: anulom vilom pranayama, KBP: kapal bhatti pranayama, DBE: deep breathing exercises, PLB: pursed lip breathing.

in Group B were given osteopathic and physical therapy respiratory treatments. Group A had a shorter recovery times with an average of 14.9±1.7 days compared to 23.9±2.3 days for Group B. The baseline and final readings revealed a considerable change [6].

Gonzalez-Gerz et al. [1] investigated efficacy of a novel breathing exercise program delivered using telerehabilitation tools in COVID-19 patients with mild to moderate symptoms in the acute stage of the disease. A total of 38 people were enlisted and divided into two groups. At home, the experimental group did the interventional activities as well as an active cycle of breathing techniques. A six-minute walk test, Multidimensional dyspnoea-12 scale, 30-second sit-to-stand test, and borg scale were used to assess the effectiveness. All outcome indicators showed significant improved scores in favor of the experimental group.

Ozlu et al. [5] conducted a study to assess the effect of progressive muscle relaxation exercise on anxiety and sleep quality in COVID-19 patients, with 33 participants in the experimental group and 34 in the control group. Progressive muscle relaxation exercises were done twice a day for five days. Findings revealed a significant difference between experimental and control groups.

In a study by Xiao et al. [4] planned to check the effect of progressive muscle relaxation training of negative mood and sleep quality in coronavirus Pneumonia patients, a total of 79 patients were divided into a control and experimental group. The experimental group received progressive muscle relaxation training in bed 30 minutes before getting up early and 30 minutes before going to bed. Their study concluded that after intervention there was a significant difference between the 2 groups ($p < 0.05$). Progressive muscle relaxation training significantly reduced anxiety and depression with improvement in sleep quality in patients with COVID-19 during home isolation.

Liu et al. [7] investigated the effects of a six-week respiratory rehabilitation program on respiratory functions, quality of life, mobility and psychological functions in older patients with COVID-19. Thirty-six individuals were involved in the study with respiratory muscle training, cough exercise, diaphragmatic training, stretching exercise and home exercises were all part of the intervention. A hand-held resistance device was used as respiratory muscle exerciser. Two sessions each week for six weeks were provided for

Table 2. Presentation of articles according to the objectives and main findings regarding Chest rehabilitation techniques and COVID-19 (2018-2021)

Author (year)	Objective of study	Intervention	Outcome measures	Results	Conclusion
Sedky et al. (2021)	The study's objective is to assess the effect of the Telemanagement technique to compare oxygen therapy combined with noninvasive positive pressure ventilation with osteopathic manipulative respiratory and physical therapy techniques applied in home isolated COVID-19 patients	Group A: received oxygen therapy with BiPAP ventilation Group B: received osteopathic manipulative respiratory and physical therapy techniques	• Arterial Blood Gases for oxygen and carbon dioxide • pH every 48 hrs • Monitoring of vitals (temperature, heart rate, oxygen saturation, and blood pressure) • Chest CT (pretreatment and post 14 days of treatment) • Duration of Recovery • Patient satisfaction questionnaire	Group A demonstrated complete resolution of symptoms as compared to Group B The responses to the patient satisfaction questionnaire showed positive feedback for simplicity, satisfaction, and effectiveness	The study concludes the effectiveness of home-based oxygen BiPAP ventilation to reduce the requirement of endotracheal intubation and also shorter the duration of the recovery period
Gonzalez-Gerez et al. (2021)	The objective of the study is to assess the feasibility of a home-based program for breathing exercises	Group 1: breathing exercises composed of a group of 10 exercises. Group 2: received assessment on day 1 and day 7	• Six Minute Walk Test • Multidimensional Dyspnoea-12 (MD12) • Thirty-Second Sit-To-Stand Test • Borg Scale	The breathing Exercise group observed a statistically significant improvement within and between-group	Breathing exercise protocol through tele rehab seemed to provide excellent outcomes among people suffering from mild to moderate COVID-19 symptoms
Özlü et al. (2021)	The objective is to determine the effectiveness of progressive muscle relaxation techniques on sleep quality and anxiety among COVID-19 patients	Experimental Group: progressive muscle relaxation exercises twice a day for 5 days for 20-30 minutes	• The Richards-Campbell Sleep Questionnaire (RCSQ) • The StateTrait Anxiety Inventory (STAI)	The experimental group's mean pretest and posttest scores on the State Anxiety Scale differed statistically significant ($p < 0.05$) in an in-group comparison. The control group's mean pretest and posttest scores on the State Anxiety Scale did not alter statistically significantly ($p > 0.05$) in the ingroup comparison.	Patients with COVID-19 found that progressive muscle relaxation training reduced anxiety and improved sleep quality
Xiao et al. (2020)	The study aims to investigate the effect of progressive muscle relaxation training on negative mood and sleep quality in Pneumonia due to COVID-19 patients.	Experimental Group: received clinical treatment issued by the National Health Commission along with the progressive relaxation exercises. Control Group: received the usual clinical treatment plan issued by National Health Commission	• The Pittsburgh Sleeps Quality Index scale (PSQI) • The Generalized Anxiety Disorder (GAD-7) • The Patient Health Questionnaire (PHQ-9)	The difference in PSQI, GAD-7, and PHQ-9 scores between the two groups after the intervention was statistically significant ($p < .05$)	During isolation treatment, progressive muscletraining canreduce anxiety and depressive episodes while it also improved quality in COVID-19 patients.Progressive muscle relaxation training has been found to improve patient treatment outcomes and is worthy of therapeutic consideration

Table 2. Continued

Vitale et al. (2020)	The study aims to assess the effect of Home-based resistance-training protocol on muscular health and physical performance in healthy older subjects during the COVID-19 pandemic	Intervention Group: received Resistance training protocol (5-min warm-up followed by 45-min of resistance training and 5-min cooldown) 4 sessions per week for 24 consecutive weeks	1. Anthropometric assessment; 2. Whole-body dual-energy X-ray absorptiometry 3. Thigh magnetic resonance imaging 4. Risk of fall assessment (mini-Balance Evaluation Systems Test) 5. Strength assessment a. the chair stand test b. handgrip strength test c. dynamometers to assess knee flexors and extensors strength	Significant changes were observed in the Intervention group with marked improvement in the Chair stand test ($p = 0.048$; ES: 1.0, moderate)	The study concluded that during the lockdown period home-based resistance training exercises have proven effective in improving lower limb strength
Shukla et al. (2020)	To compare anulom vilom pranayama (AVP), kapal Bhati pranayama (KBP), diaphragmatic breathing exercises (DBE), and pursed-lip breathing (PLB) for breath holding time (BHT) and rating of perceived exertion (RPE)	Pranayama/Breathing exercise protocol- It comprised of the 1-week duration of intervention with two sessions/day: each session of three repetitions initially. Every repetition consisted of one round of intervention i.e. 10–15 times followed by a brief rest (normal breathing)	1. Breath holding time. 2. Rate of perceived exertion	There was a significant decrease in RPE in AVP & DBE group. BHT was increased in DBE but not more than AVP	A combination of AVP and DBE are the best during lockdown to increase the pulmonary reserve and also decrease anxiety among individuals
Mohamed et al. (2021)	The goal of this study was to evaluate how aerobic exercise affected immunological biomarkers, symptom severity, and progression in COVID-19 patients.	The exercise group participated in a two-week aerobic exercise program. Walking/running on a treadmill or riding on a stationary bicycle were part of the fitness routine. Each session begins with a 5-minute warm-up consisting of slow walking or bicycling. Then, the major intervention was 30 minutes of moderate-intensity aerobic exercise (walking, jogging, or bicycling). Finally, a 5-minute cool-down exercise (walking, running, or bicycling) will be performed. The intensity of the exercise was 60-75% percent of the expected Maximum Heart Rate (MHR) (calculated as MHR = 210-age)	1. Wisconsin upper respiratory symptom survey 2. Blood sample report 3. Saliva sample report	The Wisconsin scale total score, Leucocytes, Lymphocytes, Interleukin-6, Interleukin-10, Immunoglobulin-A, and TNF-a were all non-significantly different between the two groups ($p > 0.05$). Just after treatment, the Wisconsin scale (patient-oriented illness-specific quality of life) total score in the intervention group declined significantly ($p < 0.05$), while Leucocytes, Lymphocytes, and Immunoglobulin-A increased significantly ($p < 0.05$)	The current research found that two weeks of moderate-intensity aerobic exercise reduced the severity and progression of COVID-19-related illnesses while also improving quality of life. Additionally, two weeks of aerobic exercise improved immune function by raising leucocytes, lymphocytes, and immunoglobulin A levels

Table 2. Continued 2

Liu et al. (2020)	To find the effects of 6-week respiratory rehabilitation program affected respiratory function, quality of life, mobility, and psychological function in older COVID-19 patients.	The patients were divided into 2 groups. The interventional groups included (1) respiratory training, (2) coughing activity, (3) diaphragm training, (4) flexibility exercise, and (5) home exercise was among the interventions. Participants utilized a commercially available resistance tool (Threshold PEP; Philips Co.) for three sets of 10 breaths each for respiratory muscle training; settings were set at 60% of the individual's maximal expiratory mouth pressure, with a 1 minute rest time between the two sets. Cough exercises consisted of three sets of ten vigorous coughs. To resist diaphragmatic descent, each participant conducted 30 maximal voluntary diaphragm contractions in the supine position while holding a medium weight (1–3 kg) against the anterior abdominal wall. Stretching activities stretch the respiratory muscles under the supervision of a rehabilitation specialist.	1) Six-minute walk test 2) Functional independence measure 3) SF-36 4) SAS and SDS Depression scale	There were major differences in FEV1(L), FVC(L), FEV1/FVC and 6-min walk test after 6 weeks of pulmonary treatment in the intervention group. Within the experimental group or between two groups, the SF-36 scores in eight aspects were statistically significant. After the intervention, SAS and SDS scores in the treatment group dropped, but only anxiety had statistical significance between or between two groups. To rectify the lumbar curve, lie down in a supine or lateral decubitus position with your knees bent. Patients were instructed to perform flexion, horizontal extension, abduction, and external rotation with their arms. Subjects were educated about pursed-lip breathing and cough training at home and were asked to do 30 sets per day	Six weeks of respiratory rehabilitation can enhance respiratory function, quality of life, and anxiety in older COVID-19 patients, but it does not affect depression in the elderly

Table 3. Methodological quality assessment of included studies via PEDro Scale

	Criterion*											
Authors (year)	1	2	3	4	5	6	7	8	9	10	11	Score
Shukla et al. (2020)	1	1	1	1	-	-	-	1	1	-	1	6/10
Antonino et al. (2020)	1	1	1	1	1	1	-	1	1	-	1	8/10
Sedky et al. (2021)	1	1	1	1	-	-	1	1	1	-	1	7/10
Gonzalez-Gerez et al. (2021)	1	1	1	1	1	1	-	1	-	1	1	8/10
Mohammed et al. (2021)	1	1	-	1	-	-	-	1	1	-	1	5/10
Shuaipan et al. (2021)	1	1	1	1	-	-	1	1	-	-	-	5/10
Kai Liu et al. (2020)	1	1	1	1	-	-	-	1	-	1	1	6/10
Ibrahim et al. (2021)	1	1	-	1	-	-	-	1	1	1	1	6/10
Xiao et al. (2020)	1	-	-	1	-	-	-	1	1	1	1	5/10

*The study provides measures of variability. Each positive point in studies is given score of 1 on 0 to 10 score. 1: Eligibility criteria were specified, 2: Subjects were randomly allocated to groups, 3: Allocation was concealed, 4: The groups were similar at baseline regarding the most important prognostic indicators, 5: There was blinding of all subjects, 6: There was blinding of all therapists who administered the therapy, 7: There was blinding of all assessors who measured at least one key outcome, 8: Measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups, 9: Intention to treat analysis, 10: Comparison between groups.

the individuals. Authors concluded that respiratory rehabilitation improved respiratory functioning, quality of life and anxiety in older patients significantly both within and between groups.

During COVID-19, Jacopo Antonino et al. investigated effects of a six-months home-based resistance training program on muscle health and physical performance in healthy older individuals. For 24 weeks, the exercise group performed 4-hour home-based resistance training sessions every week. Each session included a 5-minute warm-up, 45-minute of resistance training and a 5-minute of cool-down. The chair stand test (+19.8%, $p = 0.048$) and total fat mass showed significant improvements in the experimental group. Within-group differences in lower limb muscular strength were identified, but not in muscle mass or composition [8].

Interestingly during COVID-19 lockdown, Shukla et al. [9] compared effects of Anulom vilom pranayama, Kapal Bhatti pranayama, diaphragmatic breathing exercises and pursed-lip breathing on breath holding time and perceived exertion. Deep breathing exercises increased breath holding time, however, anulom vilom pranayama in combination with deep breathing exercises lowered the rate of perceived exertion ($p < 0.000$).

In another study thirty patients with COVID-19 were randomly assigned to control and experimental groups in a study conducted by Mohamed et al. [10] with the aim to explore the effect of aerobic exercises on immunological biomarkers, disease severity, and progression in patients with COVID-19. Participants in the experimental group underwent two weeks of moderate-intensity aerobic activity at a rate of 40 minutes for each session for a total three sessions per week. Authors concluded that moderate-intensity aerobic exercise reduce the severity and progression of COVID-19-related illnesses and also improving quality of life.

2. Risk of bias within studies

A risk of bias graph and summary were developed using Review Manager Version 5.4. Concealment of allocation had a low risk of bias in the production of the random item sequence whereas blinding of outcome evaluators had a high risk of bias in almost all research; this occurred because the authors did not disclose or perform these stages in the trials. Incomplete outcomes and other kinds of bias posed a high or unknown risk for the blinding items of participants and professionals. Since the study protocols and key outcomes were disclosed in detail, only the item reporting a selective outcome had the lowest risk of bias, shown in Fig. 2, and Fig. 3 shows the risk of bias summary.

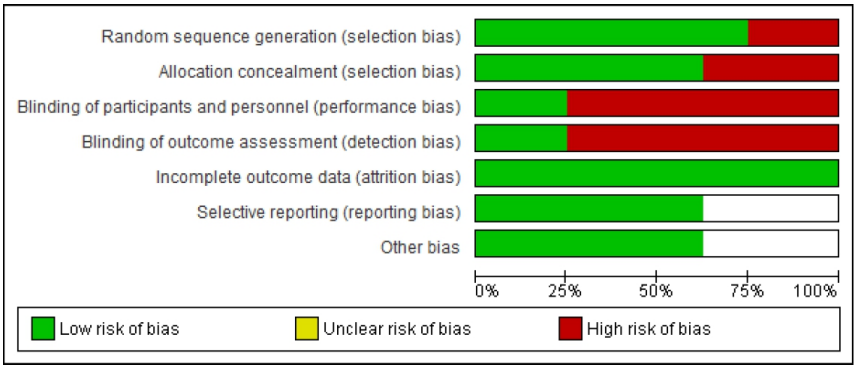

Fig. 2. Risk of bias graph for included studies.

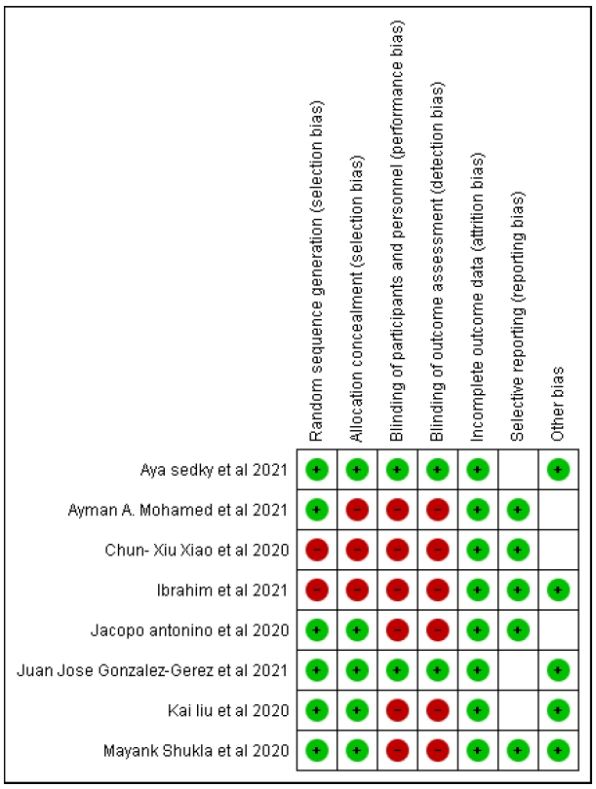

Fig. 3. Risk of bias summary for studies.

DISCUSSION

Key findings of the present review suggest that chest rehabilitation can potentially act as an important aspect in improving health-related quality of life among individuals during the COVID-19 outbreak. Respiration is a synergistic process that is constantly controlled by the autonomic nervous system and may also be deliberately controlled by one's own will, resulting in a variety of breathing patterns [9]. The goal of this study was to compile information on recent advancements during COVID-19 outbreak regarding chest rehabilitation techniques or methods.

The effects of respiratory training on hospitalized patients with severe symptomatology have been discovered and beneficial physiological parameters in blood analytics have been observed. COVID-19 infection has been linked to injuries in type I and types II pneumocytes, as well as lung endothelial injuries leading to increased secretion of protein-rich exudate in the alveolar space and vascular coagulation in lung vasculature, resulting in decreased surfactant and gas exchange [11]. As a result, the main reason for patient improvement after breathing exercises could be related to improved gas exchange and stimulation of respiratory muscles, leading to improvements in cardiorespiratory functions and low level of physical function due to COVID-19 [12]. Breathing exercises delivered via telerehabilitation seemed to be a successful technique for improving physical condition, dyspnoea and perceived effort in patients with mild to severe COVID-19 symptoms mainly in the acute period, demonstrating therapeutic benefit, compliance and program safety [1].

Patients with significant COVID-19 symptoms were also treated with a traditional Chinese medicine rehabilitation plan. Participants will engage in acupressure therapy and Liu Zi Jue Qigong exercises as part of the program. Patients in the intervention group will receive acupressure therapy and Liu Zi Jue Qigong exercises twice a day in addition to conventional therapies, and they will stay in the hospital until they are discharged [2].

Italy is one of the countries hardest hit by the COVID-19, with the Italian Ministry of Health reporting that more than 600,000 individuals have been infected and 42,900 people

have died. COVID-19 was declared a pandemic by the WHO in March 2020, and the Italian government implemented tight containment measures to prevent the virus from spreading between March 9 and May 3, 2020 [13]. As a result, home-based resistance training was sought to be a viable and alternate technique for reducing physical inactivity in the elderly population. Home-based programs being considered as an ecofriendly home-based intervention that do not require specific gym equipments or do not pose associated costs on the individuals. Previous studies have shown home-based resistance training improves older subjects' muscle strength and function capacity [14], and recently a meta-analysis found home based resistance training to be a safe and effective exercise option for specifically increasing lower body muscle strength in older subjects [15].

Patients experience two different state of feelings by tensing and relaxing muscles in a sequence during progressive relaxation techniques. This helps to relax muscles and leave the entire body calm, which helps to decrease unpleasant feelings like tension, fear and anxiety [4]. By relaxing the body, the blood pressure maintenance to near normal, boosting blood circulation, assuring muscular relaxation, progressive relaxation techniques serve to regulate the sympathetic nervous system. Sleep is an essential human requirement that serves to sustain body energy and help manage this process, even though its role is not entirely understood. After implementing progressive muscle relaxation training, the observation group's Pittsberg Sleep Quality Index scale was lower than the control group's ($p < 0.05$). This implies that progressive muscle relaxation training can assist COVID-19 patients in falling asleep and improving their sleep quality [4].

The extensive search carried by the authors and adherence to best practice of methodological recommendations are the strengths of the present systematic review. Wherever possible, the authors prioritized findings from the most current high-quality systematic reviews related to COVID-19 treatment to reduce the impact of individual primary studies referenced in numerous reviews on our conclusions. This method also lowered the contribution of earlier reviews, which were mostly narrative syntheses and included observational research as well as RCTs, to our findings. However, there are some limitations in present systematic review. To begin with, the authors may have overlooked pertinent studies by failing to do forwards/backward citation chasing. The wide range of databases checked on the other hand, would reduce the chances of missing important published studies. Furthermore, our screening process discovered eight potentially relevant articles that were not available in full text in English. In addition, by limiting the research criteria to exclude studies including neonates and pregnant women, studies that included neonates and pregnant women as study participants might have been missed.

There are still unsolved questions in respect to COVID-19 recovery and rehabilitation. The authors have limited understanding of the survivors' immediate and long-term rehabilitation needs but this is the beginning of the change.

CONCLUSION

The present study concludes that effective rehabilitation programs significantly improve the overall health-related quality of life. There is a need for improvement in the quality of research in this field and there is a paucity of evidence for effective therapies for persons recovering from COVID-19 and for other individuals who are the survivors of other illnesses. There is a scarcity of evidence relating to older persons and those who are frail, as well as a lack of agreement on outcome metrics. Future research is required to identify and assess effective therapies and better understand the trajectory and rehabilitation needs of persons with COVID-19 and other populations dealing with the pandemic across the care continuum.

CONFLICTS OF INTEREST

None to declare. No funding received for this study.

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