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Improvement in the Quality of life (QoL) with the Utilization of Mechanical Ventilation for COVID-19 Patients: A Systematic Review

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Abstract

This paper encompasses several themes revolving around the fatal COVID-19 pandemic that affected the entire world and resulted in the deaths of millions of people worldwide. In the beginning, the researcher gives a comprehensive description concerning the effects of the pandemic and how doctors and medical professionals were able to save thousands of lives with the employment of mechanical ventilation in COVID-19-infected people. The second part details the two types of mechanical ventilation and how the two modals turn out effective in treating COVID-19 and its side effects. Later, the researcher discusses the how measures have been taken to improve the Quality of life (QoL) with the employment of mechanical ventilation for COVID-19 patients. This paper presents the proposition to address the primary QoL-related findings in patients requiring hospitalization after being affected by COVID-19. It also aims to determine the characteristics of QoL on patients that were given mechanical ventilation for some time. Overall, the paper offers an all-inclusive discussion regarding the improvements that are noticeable in patients that receive this contemporary treatment.

INTRODUCTION

Acute respiratory infection caused by the SARS-CoV-2 demonstrates high transmissibility rates. In this context, Corona Virus-19 (COVID-19) emerged in Wuhan (China) in December 2019. Since then, it has spread to 215 countries, infected 48,539,872 people, and resulted in 1,232,791 deaths (the number continues to rise). With no approved treatment regimen or vaccine currently on the market, only intensive care and life-support measures have proven useful to mitigate the deleterious effects of this potentially fatal virus (Cronin *et al*., 2022).

The necessity of studying the long-term effects on survivors of the COVID-19 pandemic, a deadly virus that has afflicted 400+ million people so far and hospitalized 20% of them, cannot be overstated. The available data suggests that one-third of COVID-19-infected hospitalized patients may develop acute respiratory distress syndrome (ARDS) (Rubinson *et al*., 2022).

Complications, such as respiratory failure, acute respiratory distress syndrome (ARDS), shock, delirium, and multiple organ dysfunction, occur in about 20% of hospitalized patients with COVID-19. Besides, other respiratory symptoms, such as a persistent cough, shortness of breath, loss of or change in the usual sense of taste or smell, and a sore throat, and stuffy, or runny nose, can be managed with supportive care (Lai *et al*., 2020).

There are two different ways to administer mechanical ventilation: either as a requirement or to help with breathing on the patient's efforts. The latter modality relies on the patient's inspiratory effort to initiate breath delivery, distributes work of breathing between the respiratory muscles and the mechanical ventilator in varying proportions, and generates transpulmonary pressure via a negative pleural pressure and a positive alveolar pressure (Tarraso *et al*., 2022).

When the immune system endeavors to fight off the COVID virus infection, artificial ventilation may be necessary to keep a patient alive during the acute phase of the disease. Mechanical ventilation improves the patient quality of life (QoL) with high impact. QoL provides a complete assessment of the impact of a COVID-19 pulmonary disease on patients' daily lives. However, it is not clear whether and how these guidelines for the ventilation of patients with ARDS are applicable for the management of patients with COVID-19 pneumonia (Dar *et al*., 2021). Different HRQoL questionnaire results for post-COVID-19 patients have been reviewed extensively for accuracy. Nevertheless, there is still room for debate over the broad strokes of quality of life after leaving the hospital. Many people with HIV/AIDS may have a lower quality of life, even if they never needed hospitalization. However, research into QoL in hospitalized patients is critically important due to the extended length of hospital stay, the need for invasive mechanical ventilation, pain, and fear of death. Therefore, it is proposed here to comprehensively address the primary findings of QoL in patients who required hospitalization following COVID-19. The general characteristics of these patients' QoL need to be established and their determinants identified to aid in managing patients following hospital discharge (Tarraso *et al*., 2022). This systematic review aims to assess the post-COVID-19 QoL for hospitalized patients who were being mechanically ventilated for a certain time. Although there are numerous negative impacts of mechanical ventilation, and many theories did not prove that mechanical ventilation can improve the patient's general health, this respiration procedure still plays a crucial role in the management of COVID-19 in pneumonic patients or individuals with respiratory failure (Khan *et al*., 2020).

MATERIALS AND METHODS

Protocol

All the collected studies were selected according to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines that were set and revised before formulation of systematic reviews (Hutton *et al.*, 2016), asking a specific question based on the Participants, Intervention, Control, Outcome (PICO) model with the following framework:

- (P) Participants: patients with COVID-19 who were hospitalized and suffered from respiratory exacerbation needed to be mechanically ventilated.
- (I) Intervention: Mechanical ventilation.
- (C) Control: patients with COVID-19 who did not receive mechanical ventilation despite their pulmonary exacerbations resulting from COVID-19.
- (O) Outcome: excellent and efficient quality of life (QoL) income for patients who underwent mechanical ventilation.

The research question states: "Is mechanical ventilation intervention helpful in improving the COVID-19 patients' QoL?"

Data Sources and Search Strategy

The database sources used for this systematic review include *the National Library of Medicine (NLM), Cochrane Central Register of Controlled Trials (CENTRAL), PubMed Central (PMC)*, and *Web of Science (WOS)* electronic databases. Searches were done for findings published in the last three years until October 2022. The *MeSH (Medical Subject Headings)* terms used in *NLM*, *CENTRAL*, and *PMC* databases were: *"Quality of life"[MeSH Terms], "COVID-19"[MeSH Terms], "mechanical ventilation"[MeSH Terms], "ventilator" [MeSH Terms]* and *"hospitals"[MeSH Terms]*. In the WOS, the search terms were *mechanical ventilation*, *COVID-19 patients*, and *respiratory failure*.

The following table presents the database search terms in this systematic review.

Table 1 - Database Search Terms

Database	Search Terms
National Library of Medicine (NLM), *The Cochrane Central Register of Controlled Trials (CENTRAL)* *The PubMed Central (PMC)*	"Quality of Life" [MeSH Terms] "COVID-19" [MeSH Terms] "Mechanical ventilation" [MeSH Terms] "ventilator" [MeSH Terms] "hospitals" [MeSH Terms] failure
WOS	Mechanical ventilation, COVID-19 patients, and respiratory

MeSH (Medical Subject Headings)

Inclusion and Exclusion Criteria

The inclusion criteria for this systematic study selections were:

1. Last two years' studies.
2. Studies carried out in the hospitals.
3. Studies performed according to IDSA and COVID-19 treatment guidelines.
4. Studies that included all patients admitted and received mechanical ventilation.
5. Studies that have Quality of Life (QoL) assessment tools.

While the exclusion criteria for this systematic study selections were:

1. Studies conducted out of hospitals.
2. Studies conducted on patients who were given COVID-19 treatment without mechanical ventilation.
3. Narrative, literature, and systematic reviews.
4. Studies that did not involve any QoL for COVID-19 patients.
5. Studies out of healthcare settings application.
6. Studies older than 2020.

Data Extraction and Analysis

The reviewer first extracted data from the full texts of the included and selected articles, including background information, introduction, study sites, criteria for selecting the quality management system and authority relied upon throughout the study, analytical methods, guideline types, discussion of these data conclusions, future perspectives, and limitations. The uncertainty around the studies' eligibility was resolved during conversation between the two reviewers, allowing for the most trustworthy and appropriate results to be discussed subsequently (Tamil and Srinivas, 2015).

Risk of Bias (RoB) of the Selected Articles

The author used *Agency for Healthcare Research and Quality* (AHRQ) checklist for RoB assessment in Comparative Effectiveness Reviews to ensure that assumptions and limits have been recognized and taken into consideration when assessing validity and generalizability. This checklist might be employed to evaluate what *the AHRQ Evidence-based Practice Centers (EPCs)* risk of bias evaluation for assessing the quality of research were included in Comparative Effectiveness reviews.

Quality of the Reports in the Selected Articles

This research assessment involved the studies and guidelines provided by the authors, with a total of thirteen items. The reviewer rated each item with scores of 0 (not reported) or 1 (reported). The following table shows the checklist for the studies.

Table 2: The Studies Checklist Reported by Authors

	Daher et al., (2021)	**Ramani et al., (2022)**	**Tarraso et al., (2022)**	**Muñoz-Corona et al., (2022)**	**Valent et al., (2020)**	**Truffaut et al., (2021)**
1. Title	1	1	1	1	1	1
Abstract	1					1
2. Species	0	0	0	0	0	0
3. Key Finding(s)	1	1	1	1	1	1
4. Background	1	1	1	1	1	1
5. Reasons for Conducting this Study	0	0	0	0	0	0
6. Objectives	1	1	1	1	1	1
Methods						
7. Quality of Life Assessment Tool	1	1	1	1	1	1
8. Study Design	1	1	1	1	1	1
12. Sample Size	1	1	1	1	1	1
15. Statistical Methods	1	1	1	1	1	1

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	Daher et al., (2021)	**Ramani et al., (2022)**	**Tarraso et al., (2022)**	**Muñoz-Corona et al., (2022)**	**Valent et al., (2020)**	**Truffaut et al., (2021)**
Results						
16. Experimental Results	1	1	1	1	1	1
17. Results and Estimation	1	1	1	1	1	1
Discussion						
18. Interpretation and Scientific Implications	1	1	0	1	1	1
21. Study Limitations	0	0	1	1	0	1
22. Generalization /Applicability	0	1	0	1	1	1
23. Funding	0	0	1	0	1	0
24. Ethical Approval	1		1	1		1
Total Score	13	11	9	14	9	15

Mode Value: 11.8± 1.06. Each item judged as “0” (not reported) or “1” (reported).

The total score for each included study has been recorded.

RESULTS

Characteristics of the Studies

Studies	Study Sample	Location of Study	Analysis Methods	Conclusion(s)

A total of 492 studies (from 2020 until October 2022) selected, reviewed, and identified, and were subsequently assessed by the reviewer. After an initial screening, forty-five duplicate studies were removed. A second screening led to the removal of forty-one studies regarded as inadequate as e they did not accurately and correctly meet the inclusion criteria. The following figure shows the flowchart of the screening.

The following tables provide a general description of the studies' details.

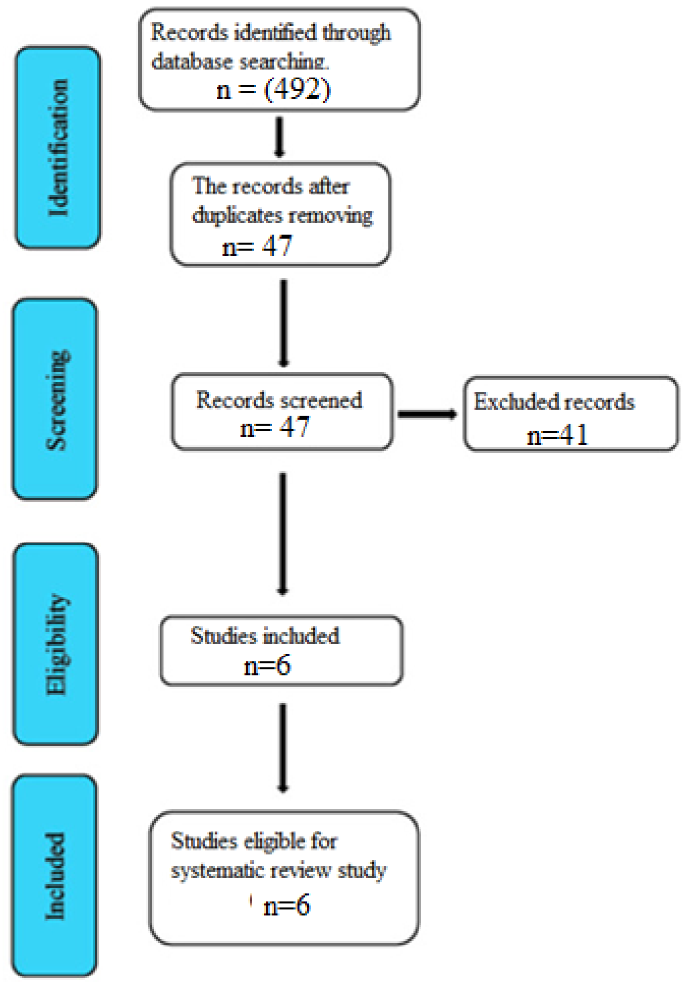

Figure 1: The Systematic Review Flowchart

Table 3: Characteristics of Included Studies

Daher et al., (2021)	About 18 patients were included in this study (61 ± 7 years; ICU-stay: 34 ± 16 and IMV: 30 ± 15 days). At follow-up (197 ± 15 days post-discharge).	At ICU in University Hospital RWTH	Several assessment tools for diagnosis and follow-up through 6 months are investigated. Patients were classified into ARDS severity categories according to the "Berlin Definition" on the day of intubation, which was used for assessment throughout their intensive care unit stay. After a patient was included in the trial, information about their laboratory tests, arterial blood gas analysis (ABG), total respiratory compliance (Crs), and ventilation characteristics, such as the partial pressure of oxygen/fraction of inspired oxygen (P/F) ratio were retrieved from the database. According to the previously reported criteria of respiratory mechanics and radiologic characteristics, two basic "phenotypes" of the pulmonary illness were determined to exist: Type L has high compliance (low elastance), low ventilation-to-perfusion ratio (low elastance), high right-to-left shunt (poor recruit ability), low lung weight (low recruit ability), while type H has low elastance (high compliance), and high lung weight (high elastance).	The patient's ability to recover fully in terms of pulmonary function and exercise capacity following COVID-19 ARDS appears to be independent of illness severity and respiratory mechanics throughout ICU stay. The most common complaints from these individuals included exhaustion and fatigue rather than mental health issues, like sadness or worry.

Ramani et al., (2022)	a total of 102 patients with COVID19 were admitted to the hospital ICU	the UVA ICU	Six weeks after being released from the intensive care unit, patients will return for follow-up care at the University of Virginia's Post-COVID-19 ICU clinic. Spirometry, lung volumes, diffusion capacity, and the 6-minute walk test were used to evaluate respiratory health and physical fitness. The Quality of Life in Neurological Disorders Adult Cognitive Function Version 2.0 Score, the Montreal Cognitive Assessment (MOCA), and the Insomnia Severity Index were used to measure depression, cognitive function, and insomnia, respectively. The University of Virginia's IRB gave their blessing to the project.	QoL improved in the group of patients who had survived severe COVID-19 pneumonia, although almost a third of them still had impaired lung function and dyspnea 8 weeks after being released from the hospital.

Tarraso et al., (2022)	Hospitalized with COVID-19-related pneumonia, 932 patients were evaluated for follow-up; 481 were eventually included. At the end of the trial, they collected complete data from 377 patients at 2 months, 312 patients at 6 months, and 284 patients at 12 months.	Not mentioned	Following the guidelines for reporting observational studies established by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE). Using the 'nsize' command in Stata 12.1, they determined the sample size needed based on data published that describes a proportion of fibrotic radiological abnormalities on chest X-ray in 27.8% of patients (SARS survivors in 2003), so they set assumptions for the maximum error to be 5% and the confidence level to be 95%. Frequencies and percentages were used to characterise qualitative variables, whereas means and standard deviations were used to characterise quantitative ones. If the Shapiro-Wilks test failed to confirm normality for continuous variables, the data were transformed into median and interquartile range format. In cases where data were normally distributed, a Student t-test was used to compare means, whereas the Mann-Whitney U test was used otherwise.	One year after being released from the hospital, around one third of patients who had survived severe COVID-19 pneumonia still had reduced lung function and dyspnea, and 23% of patients with both severe and moderate cases acquired fibrotic-like sequelae. These results reinforce the importance of monitoring patients with severe SARS-CoV-2-induced pneumonia over time to determine whether or not fibrotic alterations worsen.

Muñoz-Corona et al., (2022)	One hundred and forty-one people were diagnosed with COVID-19 and admitted to the hospital's intensive care unit. Ninety days after they were released, the patients were followed up with.	Not mentioned	assessing QoL by using demographic and clinical data alongside a validated Spanish version of the 36-item Short Form Health Survey (SF-36) for assessment and follow-up and the Kolmogorov-Smirnov test was used to guarantee a normal distribution for continuous variables.	In conclusion, they discovered that most patients with COVID-19 infection (75.9% in study sample) reported the persistence of symptoms, especially fatigue and joint pain, and that most had poorer SF-36 QoL ratings compared to patients without these symptoms even 90 days after hospital release. The quality of life (QoL) of patients and their families can be improved by ensuring that they are followed up on following sickness, preferably in a post-COVID-19 health care clinic.

Valent et al., (2020)	Fifty-four COVID-19 patients were hospitalised to the surgical intensive care unit (average age 62 [57-68], 39 males [71%], SAPS2 37.	Many data collected from 28th of December 2019 till end of 2020	This investigation was purely observational in nature; it lacked any sort from routine care data obtained prospectively (French Society of Anaesthesiology and Critical Care Medicine Institutional Review Board). Treatment of the Utmost Urgency	This early paper offered initial insights into post-severe COVID-19 episode quality of life. Given the scope of the pandemic, impairment caused by COVID19 should be a top priority for doctors and policymakers alike. Unfortunately, this issue is often overlooked.

Truffaut et al., (2021)	Sixty-three patients were brought to our ICU between March 3, 2020, and June 2, 2020, with a PCR and/or chest CT Scan confirming a diagnosis of COVID-19.	Not mentioned	All clinical and demographic data, forced expiratory volume, chest CT scan were assessed and number of inflammatory segments were used as measuring tool a=to assess the patients' QoL.	Quality of life was shown to be lower among patients with severe conditions in the intensive care unit. Similarly, at 6 months, SARS-CoV-1 survivors had lower SF-36 values in the physical and mental health areas compared to healthy individuals and patients with chronic diseases. Long-term mental health deficits are as common among ICU survivors as physical disabilities. Post-traumatic stress disorder affects 23% of the population and can last for up to 5 years.

DISCUSSION

COVID-19, SARS-CoV-2 to be exact, was first reported in December 2019. Although most patients do not get severely affected, a small percentage develop acute respiratory distress syndrome (ARDS) ultimately requiring intensive care unit (ICU) treatment. Patients who make it out of the ICU may be at risk for poor health-related quality of life (HRQoL) and persistent symptoms; however, this has not been studied. Hence, mechanical ventilation has been used for controlling respiratory distress disorders to improve patients' outcomes and raise their QoL (Wunsch, 2020).

In this systematic review, a collection of scientific-based selection procedures, including Daher et al., (2021), Ramani et al., (2021), Tarraso et al., (2022), Muñoz-Corona et al., (2022), Valent et al., (2020), and Truffaut et al., (2021), has been incorporated and discussed.

Daher et al., (2021) reported that 30 patients with severe COVID-19 and ARDS were successfully treated with IMV and released from the hospital. Six months after leaving the ICU, 18 patients (mean age 617, 61% male) were seen in the pulmonary disease outpatient clinic. This evaluation lasted until 22nd March 2021. Patients who required invasive mechanical breathing in the intensive care unit had their baseline features, medical history, and ICU characteristics documented. According to the Berlin-Definition, 5 patients (28%) had severe ARDS, while 13 patients (72%) had moderate ARDS. In the ICU, the average length of stay was 34 16 days, while in the intermediate care unit, it was 30 15 days. Extracorporeal membrane oxygenation (ECMO) was used on two patients for a mean of 13 days, plus or minus 4. Acute renal failure occurred in 7 patients (39%), necessitating dialysis or a transplant. Further, 13 patients (72%) with respiratory compliance in the first week of 50 21 mL/cmH2O had type L pneumonia, while 5 patients (28%) with respiratory compliance in the first week of 25 11 mL/cmH2O had type H pneumonia. Moreover, 13 patients (72% of the total) required the prone posture. The results of this study suggest that COVID-19 patients who require long-term therapy in an ICU are not more likely to experience post-COPD symptoms than COVID-19 patients with milder disease or patients from other patient groups who also require long-term treatment, including invasive ventilation in an ICU. Cohort examination of quality-of-life scores reveals that patients' restrictions are not attributable to mental health issues, such as sadness or stress, but rather to physical restrictions on their ability to move around and be active. While more information is becoming available on PFTs after COVID-19, there is still relatively little data on critically sick patients following invasive ventilation. This is the first study to their knowledge to indicate that patients who had a lengthy ICU stay, long duration of ventilation, and poor respiratory mechanics did not have any substantial PFT abnormalities at follow-up. No decline in pulmonary function was observed in any patient during follow-up, not even in patients with a history of diminished lung function. This finding is in line with findings from other research, including the COVID-19 cohort, in that a small percentage of patients exhibited a loss in diffusion capacity. PFT abnormalities were not associated with symptoms in the follow-up.

Ramani et al., (2021) who performed a study on a total of 24 patients (85.71%), represents the first case series of outpatient follow-up visits for patients admitted in the ICU with COVID-19; the median number of days on mechanical ventilation was 11 (IQR, 3.25-15 days). Average scores on the Sequential Organ Failure Scale, Acute Physiology and Chronic Health Evaluation II, and the Simplified Acute Physiology Score II were 6, 14, and 32 respectively. Similarly, previously published findings in ARDS also demonstrated a low prevalence of blockage and limitation. Diffusion impairment was less common in this group than in other groups studied after ARDS. The current group had a longer 6-minute walk distance than previous ARDS investigations. Most of the current patients had little or minor cognitive impairment 6 weeks after hospital release, despite receiving substantial dosages of sedation and a high prevalence of delirium in the ICU. When compared to earlier reports of survival of critical illness, only one patient still experienced difficulties with activities of daily living stood out. The rates of sadness and sleeplessness were consistent with those found in other studies of ICU survivors. Studies have shown that people of color, especially African Americans and Hispanics, are disproportionately affected by the COVID-19 pandemic. The bulk of patients seen in the clinic after the ICU belonged to these groups. They lacked sufficient long-term data to evaluate how these outcomes evolve over time, given that it was a single-center case series. Results support the viability of an outpatient clinic for COVID-19 patients after they leave the ICU. Also, they show a minimal burden of pulmonary and neurocognitive morbidity at immediate follow-up, albeit the disease's long-term impact is yet unknown.

Tarraso et al., (2022), on the other hand, treated 932 patients with COVID-19 pneumonia (reported from hospitals) whereby 481 among them were potentially eligible for follow-up. At the end of the trial, they collected complete data from 377 patients at 2 months, 312 patients at 6 months, and 284 patients at 12 months. As a result of precautions taken due to the pandemic, most of the information was lost. The cohort that made it through the full 12 months had a mean age of 60.5 (11.9). 55.3% (157/284) among them were male; the proportion of men increased significantly with increasing severity (from 50.2% (105/209) to 60.9% (14/23) to 73.1% (38/52) [p=0.010]). Hospitalization duration [p0.001], RALE scores [p0.001], and laboratory markers (lower lymphocyte count and higher peak levels of lactate dehydrogenase, C-reactive protein, ferritin, and D-dimer) were also significantly different between the two groups. Age, comorbidities, smoking, and body mass index (BMI) showed no significant differences across groups. Appointments following a hospital stay typically occurred 63 (14), 181, (10), and 365 (14). By comparing pulmonary function tests taken after and before mechanical ventilation, it was found that 53.8% (203/377) of patients had diffusion impairment (80% of predicted DLCO) at 60 days, with a decreasing trend by 180 days (46.8% [146/312] and 365 days (39.0% [113/284]; p0.001 for both). The average DLCO across visual channels V1, V2, and V3 was 78.5 (19.1), 81.6 (16.4), and 84 (16.1), respectively (p0.001). Significant differences between mild and moderate [p=0.001] or severe [p0.001] patients were also identified only at 2 months when the dynamics of diffusion changes (% of predicted DLCO) as a function of severity (groups 1, 2, and 3) were assessed. Mechanical stress and an induced "biotraumatic" inflammatory response involving cytokine, chemokine, and growth factor release are known to contribute to the development of fibrosis. The prevalence of radiological abnormalities in the severe category further validates earlier findings. However, evaluating fibrotic sequelae following COVID-19 infections without considering artificial breathing may show changes directly generated by the effect of the virus. Recent research has shown that mechanical ventilation is not a reliable predictor for improving patients' quality of life. The study found that 4.8% of mild patients had inflammatory interstitial lung disease at 3 months, and at 6 months.

Muñoz-Corona et al., (2022) found that investigated the cases of 141 patients who had met the hospitals' discharge criteria (90 days' hospitalization). A 1.47:1 male-to-female ratio was observed. The average patient age was 52.24 years old in this survey. 112 (79.4%) patients had chronic comorbidities at the time of the study, the most common of which were hypertension (46.1%), diabetes (33.3%), and obesity (31.9%). Malnutrition, hypothyroidism, panhypopituitarism, latent TB, vascular insufficiency, and bipolar disorder with mechanical ventilation were among the other comorbidities observed in 13 (9.2%) people for an average of 12.2 days. After examining 141 individuals (90 days after they were released from the hospital with SARS-CoV-2 infection), the researchers detailed the persistence of COVID-19 symptoms and QoL and found differences in QoL domains with respect to the absence or presence of continuing symptoms. Epidemiological and clinical data was gathered. It was found that male patients were more likely to have severe illness and be hospitalized due to COVID-19. Although older age is a known risk factor for poor health outcomes, the study found a much lower mean age of patients (52.24 years) as compared to other reports (mean ages of 57 and 62 years, respectively). Moreover, most patients with COVID-19 infection (74.9 percent in the study) reported the persistence of symptoms, especially fatigue and joint pain, 90 days after hospital discharge, whereby most had poorer SF-36 QoL ratings as compared to individuals with no such symptoms. The quality of life (QoL) of patients and their families can be improved by ensuring that they are followed up on, preferably in a post-COVID-19 health care clinic.

Valent et al., (2020) reviewed 54 COVID-19 patients admitted to the surgical ICU (mean age 62 [57-68], 39 males [71%], SAPS2 37 [27-49]). The median (interquartile range) length of time someone spent in the ICU while on mechanical ventilation (MV) was also 12 days (range: 5.5-15.8). 13 patients (24% of the total) were found to have a pulmonary embolism, 28 (51% of the total) had acute renal injury, and 15 (27% of the total) required a surgical tracheostomy for the weaning of complex mechanical breathing. ICU deaths totaled 16 (29%). 19 out of the total 38 survivors had been checked on after three months. Three months following a severe COVID-19 event, all survivors exhibited impaired scores across all areas of the SF-36. Two of the SF-36 domains, role physical (50.0 [00.087.5]) and overall health (35.0 [35.040.0]), showed decline. At 3 months, the EQ-5D-3 L was 7.0 [6.0-9.0], with 17 (89%) patients reporting pain or discomfort, 9 (47%) reporting decreased mobility, 8 (42%) reporting decreased participation in usual activities, 8 (42%) reporting increased anxiety/depression, and 2 (10%) reporting decreased ability to take care of oneself. All severe COVID-19 survivors in this pilot research reported poor health status three months after treatment. Almost half of the patients also experienced mental health issues and decreased mobility due to muscular weakening and articular pain, and up to 80% of the survivors reported experiencing pain or discomfort on a regular basis. These results are consistent with the results in studies documenting the after-effects of ARDS in patients who had previously survived other viral infections associated with high morbidity and mortality rates. Quality of Life at 1.5 years post-diagnosis was lower in H7N9 survivors as compared to a population norms sample. The SF-36 scores of patients who survived ARDS due to influenza A(H1N1) pdm09 virus infection was lower than those of the general population at the 1-year follow-up. The COVID-19 pandemic, on the other hand, demonstrated a grander scale, and its effects would place a strain on critical care services that is unsustainable at this time, especially in developing nations. Post-intensive care syndrome (PICS) is a condition that can last for years after patients are released from the ICU. Consistent with the clinical profile of severe COVID-19 patients, patients at risk of developing post-intensive care syndrome frequently have comorbidities (such as diabetes or hypertension) and need extended mechanical breathing. Prolonged supportive care, profound sedation and neuromuscular blockade, and repeated prone positions are all associated with an increased risk of post-intensive care syndrome in patients with severe ARDS. It is possible that COVID-19 patients are more likely to experience physical and psychological complications due to the restrictions placed on their ability to receive visitors and benefit from social and rehabilitative services owing to the fear of spreading the disease. Lack of specialized multidisciplinary follow-up, as well as the dispersion and diversity of aftercare programs, may further hinder recovery. Patients with COVID-19 are at a higher risk for future hospitalization, which might drive up healthcare expenditures if adequate support is not provided. The research has certain caveats. To start, it is possible that the results do not apply to the entire group of COVID-19 patients who end up in the ICU because of the virus. Second, healthy survivors are more likely to attend in a follow-up consultation session. However, half of survivors did not participate in the follow-up service, indicating a selection bias. Possible causes include a high rate of patients who disappear without a trace and a lack of social security coverage. However, patients from disadvantaged backgrounds may be especially vulnerable to the after-ICU blues and diminished HRQoL. Finally, there was inadequate medical data on relevant variables that may change the reported HRQoL levels. The study lacked data on the dose and duration of sedatives and neuromuscular blocking medications, both of which have been found to alter long-term results. Yet, this was not the case. Also, the researchers were unable to assess the effect on family members of patients (family post-intensive care syndrome) and caregivers. HRQoL should be classically investigated at the six-month follow-up.

In a multivariate analysis, a study by Truffaut et al., (2021) revealed a low forced expiratory volume in 1 second (FEV1) and how it was linked with a high APACHE II score (p=0.049), and a low total lung capacity was associated with the need for mechanical ventilation (p=0.044). First number of affected segments on chest CT scan was linked with DLCO impairment, poor FEV1, and the number of affected segments after 3 months (p0.001,0.001, and 0.01 correspondingly). However, it was not associated with the initial radiologic pattern (GGO, consolidation, fibrosis). Glucocorticoids (GC) was connected to improved results in the metrics (p=0.02, 0.008, and 0.04, respectively). Males fared worse than females in terms of DLCO impairment and FEV1 (p0.001 and 0.005, respectively). When QoL is considered, low SF-36 values were linked with APACHE II (p=0.026), MV (p=0.05), MV duration (p=0.004), and ICU length of stay (p=0.002). In a multivariate analysis of demographic and medical data, the presence of obstructive sleep apnea (p=0.001) was the only predictor of fibrosis on a chest CT scan performed at 3 months. This is the first publication to examine the long-term outcomes of patients who got critically ill due to COVID-19. After 3 months, patients still had significant impairments in lung function, exercise capacity, exertional dyspnea, and quality of life. Few individuals had their radiological abnormalities fully normalized, but most had significant improvements. As mentioned before, impaired DLCO is a common anomaly that lasts after coronavirus infection. In this respect, SARS-CoV-2 resembles the earliest coronavirus outbreaks (SARS CoV-1 in 2002 and MERS in 2012). Changes in DLCO have been observed in these patients, with 24-37% of survivors showing persistent significant impairment in DLCO at one-year post-diagnosis. Recent evidence suggests that DLCO impairment is widespread in COVID-19 patients; it is seen in 39-53% of hospitalized patients one month after discharge and in 16% three months later. In keeping with the poor condition of patients, it was found that 45% of them had decreased DLCO in series. After a year, 65% of ARDS survivors had impaired DLCO, making it the most common impaired lung functional marker. Restrictive patterns were seen in 27% of patients. A month after being released from the hospital, 12-23% of COVID-19 patients have been reported to be affected by it. Previous research has linked SARS CoV-1 to poor PFT and chronic chest X-ray abnormalities. Three months after leaving the ICU, the patient's MIP was 82%. MIP was 53% at discharge and climbed to 68% after 6 months (significantly better than what was observed in prior large series of patients undergoing protracted MV). Recovery of respiratory muscle power may be quicker in COVID-19 than in other causes of acute respiratory failure. The mean MIP was 80% in a small, severe COVID-19 series tested 30 days after discharge. Regardless that half of study patients were obese, a condition that compromises respiratory muscle power, they all made good recoveries. Quality of life was shown to be lower among patients with severe conditions in the ICU. This was more concerned with mental health, vitality, and suffering than with physical restrictions. Surviving SARS-CoV-1 patients also had inferior physical and mental health SF-36 ratings 6 months after infection as compared to healthy controls and patients with chronic diseases. Long-term mental health deficits are as common among ICU survivors as physical disabilities. Up to 23% of people with traumatic experiences also develop PTSD, which can last for up to 5 years. Characteristics like those described in SARS-CoV-1 survivors were found. Isolation, apprehension about spreading illness, and a lack of contact with loved ones, all contributed to patients' diminished emotional well-being throughout their ICU stays.

Conclusion

To conclude, if COVID-19 patients are admitted with respiratory failure or distress, or other exacerbated respiratory symptoms due to COVID-19 infection, a large percentage of patients about 6 months after requiring ICU admission demonstrated a worsened quality of life, diminution of the functional status, and persistent symptoms as compared to their pre-COVID-19 status. Quality of life (QoL) is a crucial indicator for measuring the post-COVID-19 cases' deterioration or remission. It was noted that mechanical ventilation may have a great positive impact on patients' health after a certain period (after hospital discharge). These findings corroborate those of previous research which found that critically ill survivors of ARDS, other than that caused by COVID-19 and ICU survivors from other causes, had poor long-term outcomes. The term "long covid" is used to characterize illness in patients who have recovered from COVID-19, but are still reporting long-term consequences of the infection, or who have had the typical symptoms for a much longer period than would be expected. There needs to be post-discharge follow-up clinics for such patients so that they may learn more about the long-term effects of ICU care and other hospital and community-based initiatives that may help reduce or eliminate the effects. Improving knowledge of the underlying pathophysiology, assessing the efficacy of in-hospital ICU and hospital treatment, and determining the effect of rehabilitation programs on long-term outcomes following critical COVID-19 are all top research concerns. It has been described how ICU diaries and early rehabilitation15 can help minimize post-traumatic stress disorder and its long-term consequences.

Recommendations

More studies about quality of life (QoL) measurements in patients with post-COVID-19 syndromes are needed. Additionally, there is a need to have more sample size for cohort perspective studies in measuring respiratory functions before and after getting infected with COVID-19. It is crucial to study other exacerbations that are related to deteriorations of respiratory functions in post-COVID-19 patients.

Conflicts of interest statement?

I confirm that I have a financial or other interest in the subject/matter of the work in which I will be involved, which may be considered as constituting a real, potential or apparent conflict of interest.

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