Mental Health Implications After Post-Covid-19 on Survivors: A Scoping Review

Rozainee Khairuddin, Ramesh Kumar Ramachandren, Hilwa Abdullah @ Mohd. Nor

Centre of Human and Societal Well-being, Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia.
Corresponding Author Email: rozaineekhai@ukm.edu.my

Abstract
COVID 19 infection can cause long term damage to the brain and other parts of the body resulting in challenges, cognitive difficulties and emotional distress. The purpose of this study was to examine the tools that are utilized for evaluating health implications in individuals who have recovered from COVID 19 well, as the overall impact on mental wellbeing. The researchers conducted a review of studies published between January 2020 and April 2022 by searching databases such as PubMed, Scopus and ProQuest. A total of 20,166 studies was identified and Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) was used. The selected studies employed assessment instruments to evaluate health status among individuals affected by COVID 19. The Hospital Anxiety and Depression Scale (HADS) emerged as the used tool. Additionally, other scales were utilized to measure depression, anxiety levels, post-traumatic stress disorder (PTSD) and mental wellbeing. The findings from this review indicated that mental health issues and psychiatric symptoms persisted even after patients were discharged from hospitals. Several factors such as age, presence of comorbidities or underlying conditions ICU admission history, female gender involvement, and living in low income countries were identified as contributors, to anxiety disorders depression symptoms, and post-traumatic stress disorder (PTSD).
Keywords: Post Covid-19, Mental Health, Assessment Tools

Introduction
A worldwide coronavirus disease 2019 (COVID-19) has swept the globe, resulting in a worldwide pandemic (Woods et al., 2020). As a result, the World Health Organization (WHO) designated COVID-19 a public health emergency worldwide (Team., 2020).
There is a fast-developing corpus of literature on the clinical manifestations and therapies for this disease. Fever, musculoskeletal symptoms (fatigue, myalgia, joint pain), dry cough,

dyspnea, gastrointestinal symptoms, and anosmia with or without ageusia are all common in the acute stage of the disease (Cipollaro et al., 2020).

The World Health Organization (WHO) and other organisations are working together to expand scientific knowledge to track the spread and consequences of the virus, with the goal of providing timely advice on controlling and mitigating the virus's transmission and impact. Leading health organisations, including WHO, are collaborating with medical experts, government agencies, and public health scientists to improve understanding of the disease and its effects (United Nations, 2020).

The brain is one of the most important organs in the body, and with COVID-19 infection it can cause long-term damage to the brain as well as other parts of the body (Wu et al., 2020). It can also result in long-term physical difficulties, cognitive impairment, and emotional distress (Ellul et al., 2020; Wostyn, 2020; Komaroff & Bateman, 2021).

In a recent study by Nen et al (2022), shed light on the overall effective management of depression, anxiety, and fear levels during Covid 19. However, that a minority subset of the study's participants reported encountering intense and severe expressions of depression, anxiety, or fear.

In other findings of the study by Rathakrishnan et al. (2022), revealed a noteworthy association between the respondents' elevated fear levels and their heightened mental health status. Intriguingly, individuals exhibiting a pronounced degree of spirituality exhibited a correspondingly lower level of mental health. The results indicated that spirituality played a significant mediating role in the relationship between fear and mental health.

In another, study finding indicate that the majority of families encounter difficulties in caring for individuals with Neurodevelopmental Disorders (NDD) because of the heightened occurrence of behavioral and emotional issues in the context of the COVID-19 pandemic (Aziz et al. 2022).

Furthermore, it is noteworthy that the study by Ke et al. (2022), shows participants encountered psychological distress attributable to several significant stressors, including the prevailing economic instability induced by the COVID-19 pandemic, the substantial alterations in lifestyle necessitated by quarantine measures, and the pervasive anxiety stemming from the potential risk of contracting COVID-19.

Research by Zakaria et al. (2022), examined the connections between pandemic fatigue, compliance with Standard Operating Procedures (SOPs), emotional distress, work-family conflict, and physical risks among 2047 respondents in 14 Malaysian states through a cross-sectional survey. It found no significant correlation between pandemic fatigue and SOP compliance but revealed robust positive associations between pandemic fatigue and emotional distress, work-family conflict, and physical risks, highlighting the need for ongoing monitoring and intervention as the Movement Control Order's duration continues.

Besides the above, interstitial pneumonia and respiratory distress syndrome are caused by the coronavirus, which can lead to multiple organ failure. According to Tenforde et al. (2020), it can induce long-term disease and symptoms not just in the elderly but even in young adults and people who have no or few chronic underlying medical issues (Zhou et al., 2020). Even three months after the onset of the disease, up to 24 percent of COVID-19 patients may experience long-term symptoms (WHO, 2020; Cirulli et al., 2020). According to Bryson (2020), Santus et al. (2020), patients who recover could still have hypoxia, shortness of breath, and diminished capacity to work.

For long-term impacts of SARS, MERS, and other respiratory infections in the past, people have shown similar persistent tiredness, decreased physical ability, anxiety, post-traumatic stress disorder (PTSD), and sleep issues (Ahmed et al., 2020). Various countries have taken a range of precautions to prevent the virus from spreading. Quarantines at the city level, patient seclusion, and social distancing measures are examples of these. COVID-19 transmission is considerably reduced by social distancing measures, mask wearing, and the closure of restaurants, clubs, and entertainment-related enterprises (Courtmanche et al., 2020).

Such policies have an impact not only on the economic and education sectors, but also on the physical and mental health, as well as the quality of life of affected patients (de Matos et al., 2020; Tran et al., 2020). Very little is known about the impact of Covid-19 on mental health of Acute Covid (4 weeks from onset of symptoms) and Long Covid patients and especially the instruments used to evaluate the seriousness of the disease. Therefore, the aim of this study was to review studies on post-COVID-19 instruments and mental health implications.

As a consequence, researching post-COVID-19 mental health implications that impair quality of life is critical in order to improve rehabilitation programmes, assist patients and to assist healthcare companies in developing effective treatment centres.

Methods
Study Design
This review was carried out using the methodological framework proposed by Arksey and O'Malley, (2005). The following five steps were used: a) defining a clear research objective and search strategies, b) finding specific published studies, c) choosing research papers, d) extract useful and charting data, and e) summarising, analysing, discussing, and communicating results. Besides that, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards were used to report this review, Moher et al., (2009).
Identifying the review questions.
The following are the review question:
What are the mental health implications of Covid-19?
To what extent does Covid-19 have an effect on patients' mental health?
What are the long-term effects of Covid-19 on patients' mental health?
Is there a variation in the effect of Covid-19 on the mental health of patients based on the study country?
What are the major factors (e.g., age, gender, illness severity) influencing the mental health of Covid-19 patients in the short and long term?

Literature Search Strategies
Studies for this review were identified by searching the PubMed, Scopus, Proquest and databases for items dated from 1 January 2020 to 1 April 2023. The search terms were ("COVID-19" OR "2019 novel coronavirus" OR "SARS-CoV-2" OR "2019-nCoV" OR "Coronavirus 2019") AND ("Follow up" OR "Discharge" OR "Post discharge" OR "Long-term effect" OR "Post-covid") AND ("mental health" OR "psychological" OR "psychiatric".

Eligibility Criteria

The following criteria were used for inclusion:

Original articles (case series, cross-sectional, observational studies such as cohorts) that were pre-printed or peer-reviewed, were assessed by measurement tools, which examined mental health state, reassessed patients at least one month after the onset of COVID-19 or after hospital discharge, and were published in English. Studies that were randomised clinical trials, review papers, standards and guidelines, protocol studies, and case studies were eliminated. If they featured patients who were not adults, and if they had been written in a language other than English.

Results

Search results

The flow diagram in Fig. 1 depicts the process of searching for and selecting relevant studies using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). By searching using syntax tailored to each database, we discovered 20,166 studies and eliminated 16,522 as duplicates. The titles and abstracts of the remaining studies (n = 3,644) were reviewed, and 3,554 of them were removed due to inappropriate titles and/or abstracts, leaving 90 investigations. Full-text screening revealed that 41 studies failed to fulfil the inclusion criteria and were thus eliminated. Finally, 49 papers satisfied our criteria for inclusion and were included in this study.

In two phases, the titles and abstracts of all residual papers were evaluated by two separate reviewers (R.K., H.A). The complete texts of the papers were then independently evaluated by the same two reviewers to ensure that they matched the qualifying criteria. In situations of dispute, a third researcher (R.K) was contacted to make the ultimate judgement. Author, publication year, study design, country, sample size, patient age (e.g. mean, median, range), Covid -19 confirmed cases, follow-up period, hospitalisation period, outcomes and their measurement tools, prevalence of outcomes, and mean (standard deviation [SD]) or median (interquartile range [IQR]) score of each outcome were extracted for each article. In this review, we used descriptive synthesis and analysis to examine the data. The study's main findings were the implications of Covid-19 on the mental health of Covid-19 patients.
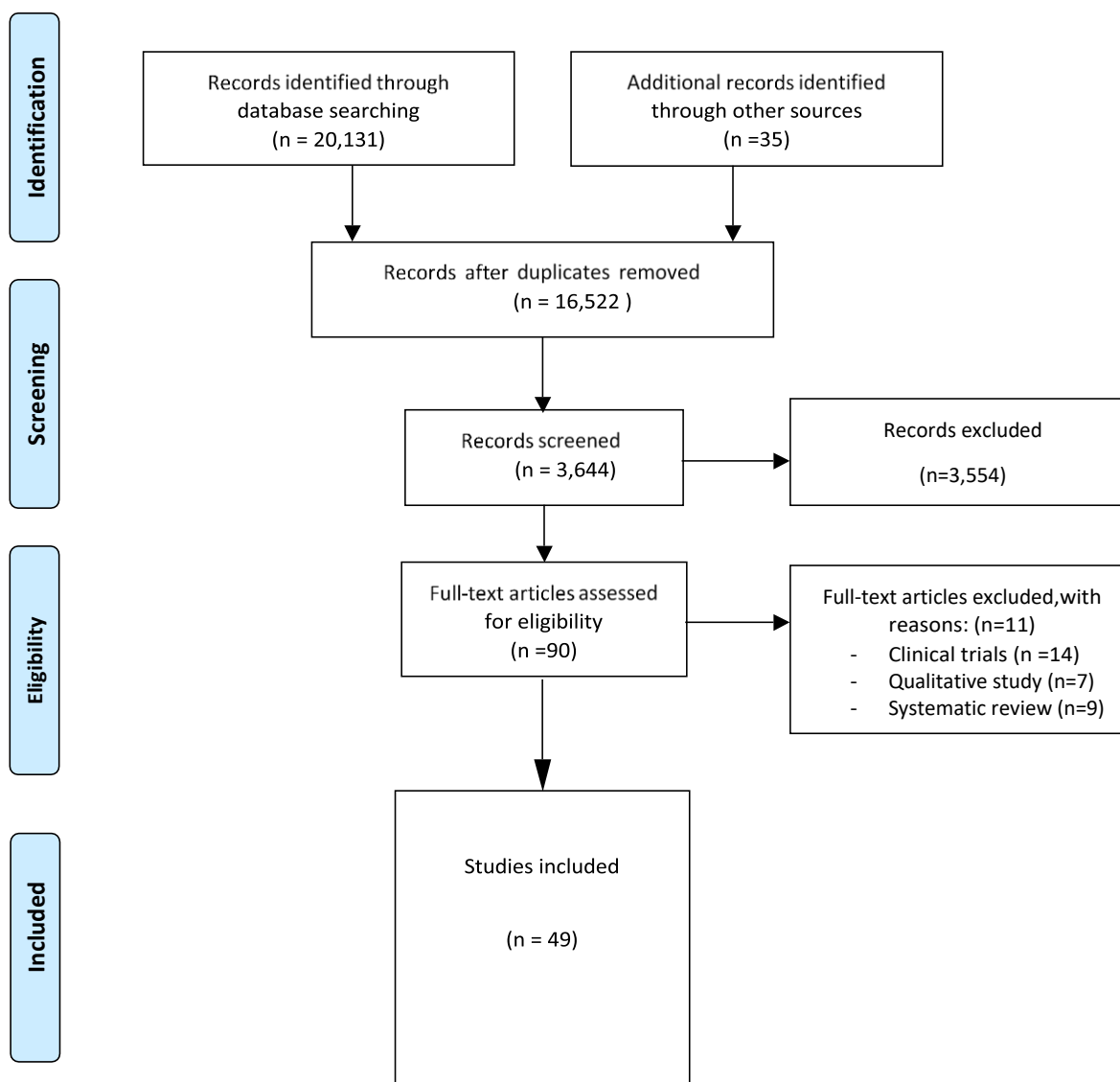
Fig 1. Study selection

Characteristics of Included Studies

Table 1 summarises the features of all 49 included studies. The total number of participants in all 49 research was 263,447, with sample sizes ranging from 10 patients in a case series to 236 379 people in a retrospective cohort analysis. The distribution of studies based on countries are: Spain (n=3), Italy (n=11), the United Kingdom (n=5), China (n=9), Korea (n=3), Germany (n=2), the Netherlands (n=2), the United States (n=3), France (n=2), Iran (n=1),

Bangladesh (n=1), Dubai (n=1), Brazil (n=1), Pakistan (n=1), Egypt (n=1), Austria (n=1), Turkey (n=2).

These studies had eight cohort studies, fourteen cross-sectional studies, ten prospective cohort studies, two online surveys, three case series, five uncontrolled observational studies, one retrospective and one prospective cohort study, four retrospective cohort studies, and one prospective longitudinal study.

The following are mental health assessment tools reported in 49 studies (Table 1) : Hospital Anxiety and Depression Scale (HADS) (n=10), Hamilton Rating Scale for Depression (HRSD) (n=1), The 36-Item Short Form Health Survey (SF-36) (n=1), Post Traumatic Stress Disorder Checklist (PTSD) , PTSD (IES-R), PTSD-SS, PTSD (PCL-5), PTSD (PCL-C), PTSD (DTS), PTSD: TSQ, PTSD (IES-R-K) (n=20), General Anxiety Disorder-7 (GAD-7) (n=13), Patient Health Questionnaire-2 (PHQ-2)(PHQ-15)(PHQ-9)(n=17), The Global Severity Index (GSI) (n=1), Positive Symptom Total (PST) (n=1), Positive Symptom Distress Index (PSDI) (n=1), The State-Trait Anxiety Inventory (STAI) (n=2), The Perceived Stress Scale (PSS-10) (n=1), Coronavirus Anxiety Scale (CAS) (n=1), Depression Anxiety and Stress Scale -21 (DASS-21) (n=1), Zung Self-Rating Depression Scale (ZSDS) (n=1), Beck Depression Inventory (BDI-13)(n=4), PROMIS Global Health-10 instrument (n=1), Centre for Epidemiology Scale for Depression (CES-D) (n=1), Geriatric Anxiety Scale- (GDS-15), (GDS-10) (n=1).

Ten out of forty nine studies used HADS tool to assess the mental health status of patients contracted Covid -19 (Albu et al., 2021; Gonzalez et al., 2021; Latronico et al., 2021; Morin et al., 2021; Poyraz et al., 2021; Rass et al., 2021; Tanriverdi et al., 2021; Tomasoni et al., 2021; van den Borst et al., 2021; Venturelli et al., 2021). The Hospital Anxiety and Depression Scale (HADS) is a reliable instrument for self-assessment scale for detecting states of depression and anxiety in the setting of an hospital medical outpatient clinic (Abdilahi et al.,2020). The questionnaire comprises seven questions on anxiety and seven questions on depression. Most of the studies were conducted in Italy (3/10) and studies were mainly cross sectional.

Amongst studies that reported HADS scores, eight studies was done after Acute stage (Post-Acute stage), i.e. Long Covid (>4 weeks) (Albu et al., 2021; Gonzalez et al., 2021; Poyraz et al., 2021; Rass et al., 2021; Tanriverdi et al., 2021; Tomasoni et al., 2021; van den Borst et al., 2021; Venturelli et al., 2021). Besides that one study assessed after 4 weeks (Morin et al., 2021) and another at 3, 6, 12 months (Latronico et al., 2021).

Only one prospective cohort study was conducted using HRSD among Covid - 19 survivors during acute stage (< 4 weeks) in Italy (Alemanno et al., 2021). The HRSD is the most widely used clinician-administered depression assessment scale. The original version contains 17 items pertaining to symptoms of depression experienced over the past week. The HDR was originally developed for hospital inpatients, thus the emphasis on melancholic and physical symptoms of depression (Hamilton, 1960). The findings in the study show that age of the patient is regarded as a risk factor.

Based on the search there was only one prospective cohort study in the UK using SF-36. A 36-item short-form (SF-36) was developed to study health status. The SF-36 was developed for use in clinical practice. The SF-36 assesses eight health concepts: 1) limitations in physical activities because of health problems; 2) limitations in social activities because of physical or emotional problems; 3) limitations in usual role activities because of physical health problems; 4) bodily pain; 5) general mental health (psychological distress and well-being); 6) limitations in usual role activities because of emotional problems; 7) vitality

(energy and fatigue); and 8) general health perceptions (Ware and Sherbourne, 1992). The study investigated mental wellbeing during the post-acute stage (> 4 weeks) in the 3rd month. The study concluded that mental wellbeing was the same in the healthy population and COVID -19 survivors. This could be due to small sample size (n=110) or mental health improvement over time.

There are 22 studies conducted using PTSD assessment tools namely from Italy, China, Korea, Netherlands, UK, Dubai, Brazil, Pakistan, Spain, France, Turkey with a total of 5,967 subjects. Amongst 22 studies that reported PTSD scores, five studies assessed during Acute stage (<4 weeks), nineteen studies after Acute stage (Post-Acute stage), i.e. Long Covid (>4 weeks) and for three studies there was no information. The study design was mainly cohort studies and cross sectional. The overall findings gathered was that the high prevalence of mental health issues was observed among male, female, early convalescent, hospitalized especially ICU patients, young, suffered depression from 4 weeks to 3 months after discharge, emergent psychiatric sequelae even in non-critical patients. On the other hand, PTSD was found to have a similar score for both ICU and non-ICU patients, more in discharged patients' vs hospitalised. In some studies there were only mild, generalised and less frequently impaired mental health, especially depression and anxiety.

13 studies found to have investigated using Generalized Anxiety Disorders (GAD). The 7-item Generalized Anxiety Disorders Scale (GAD-7; Spitzer et al., 2006) was developed as a screener for generalized anxiety disorder (GAD) in primary care settings. Originally, the development of the GAD-7 started with 13 items based on the criteria for GAD in the Diagnostic and Statistical Manual for Mental Disorders, Fourth Edition (DSM-IV) and other items in anxiety measures. Items were then correlated with the total score. The seven items with the highest correlation with the total 13-item scale were selected (Spitzer et al., 2006). The seven items assess (1) feeling nervous, anxious, or on edge; (2) being able to stop or control worrying; (3) worrying too much about different things; (4) trouble relaxing; (5) being restless; (6) becoming easily annoyed or irritable; and (7) feeling afraid as if something awful might happen. Even though GAD-7 was developed for GAD, it is also used in other anxiety disorders. The GAD-7 is increasingly used as a measure for anxiety in general and in anxiety disorder research. About 12 studies were identified using the GAD-7 and 19,907 subjects were evaluated mainly in countries like the UK, Germany, China, Bangladesh, Dubai, Brazil, Spain, Korea and the Netherlands. Majority research design used was cross sectional, cohort and case series. Four studies was assessed during Acute stage (<4 weeks), five studies after Acute stage (Post-Acute stage), i.e. Long Covid (>4 weeks) and no information provided in four studies. The studies outcome was the mental health symptoms elevated in in-patients admission, ventilation support, and psychiatric comorbidity, female and at the same time some studies showed no indication of anxiety.

The total number of subjects assessed using PHQ was 34,514, in the UK, Germany, Netherlands, China, Bangladesh, Dubai, Brazil, Pakistan, Korea, Spain. Four studies were assessed during Acute stage (<4 weeks), seven studies after Acute stage (Post-Acute stage), i.e. Long Covid (>4 weeks) and five studies have no information on the follow-up duration. The findings were that the factors that contributed to mental health issues survivors were hospitalized, on ventilation support, young, comorbidity, female, and some studies showed no significant differences in depression score. The PHQ-9 is a multipurpose instrument for screening, diagnosing, monitoring and measuring the severity of depression: The PHQ-9 incorporates DSM-IV depression diagnostic criteria with other leading major depressive

symptoms into a brief self-report tool. The Patient Health Questionnaire (PHQ) is a self-administered version of the PRIME-MD diagnostic instrument for common mental disorders. The PHQ-9 is the depression module, which scores each of the 9 DSM-IV criteria as "0" (not at all) to "3" (nearly every day) (Kroenke et al., 2001).

Table 1
Mental Health among Covid-19 Survivors

No	Author	Study design	Country	Sample characteristics	Follow up duration	Measurement tools/Result	Findings
1	Albu et al., 2021	cross-sectional observational study	Spain	*N*=30 Age Range (Median): 54 F: 11	3 months	Anxiety & Depression: HADS: Anxiety: 6(4-10) Depression: 8(3-9)	At cohort level, 11 patients had high anxiety and depression sub-scores (>8 p) and 4 patients had increased depression score only.
2	Alemanno et al., 2021	Prospective cohort study	Italy	*N*=87 Age range (Mean): 67.23 F:25	1 month	Depression -HRSD Group 1(Orotracheal intubation): 45.2% Mild to moderate depression. Group 2(Non-Invasive Ventilation) 33.3% Mild depression Group 3(Venturi masks) 37.9% Mil depression Group 4(No oxygen therapy) 44.4% mild moderate depression	The age of patients appeared as a risk factor for neuropsychological impairments due to COVID-19.
3	Arnold et al., 2021	Prospective cohort study	UK	*N*=110 Age range (Mean): 59.64 F: 42	3 months	SF-36 (Mental Health) Mild: 68 (19) Moderate: 67 (21) Severe: 58 (28)	Mental wellbeing was similar to healthy population norms
4	Bellan et al., 2021	Prospective cohort study	Italy	*N* = 238 Age range(Medi	4 months	PTSD (IES-R) 25.6% mild symptoms 11.3% moderate symptoms	Male sex was the only factor independently associated with the presence of moderate to severe PTS symptoms

				an):61 F: 96			
5	Cai et al., 2020	Online survey	China	$N = 126$ Age range(Median): 45.7 F: 66	After hospital discharge	Post- traumatic stress disorder self-rating scale (PTSD-SS): (31%), Self-rating depression scale (SDS): (38.1%), Self-rating anxiety scale (SAS):(22.2%)	The current study presents data on the short-term mental health consequences of COVID-19, suggesting that COVID-19 survivors during early convalescence suffer a high incidence of psychological distress, including excessive stress, anxiety and depressive moods.
6	Chamberlain et al., 2021	Online survey general population	UK	$N = 13\ 049$ Age range:More than 16 F:N/A	N/A	(GAD-7 and PHQ-2) Compared with mild COVID-19, significantly elevated rates of PTSD symptoms were identified in those requiring medical support at home (effect size 0.178 s.d., P = 0.0316), those requiring hospital admission without ventilation (effect size 0.234 s.d., P = 0.0064) and those requiring hospital admission with ventilator support (effect size 0.454 s.d.,P < 0.001).	PTSD symptoms were disproportionately elevated in those requiring in-patient admission, especially those requiring ventilation support, compared with those who had mild COVID-19 symptoms that had been managed at home.
7	Chang et al., 2020	Cross sectional study	Korea	$N =64$ Age range (Mean): 54.7 F:36	Mean: 75.7 days after hospital	PTSD (PCL-5):20.3% By telephone interview:	The prevalence rate of PTSD was 20.3% in patients with COVID-19 who had been hospitalised, treated and discharged.

					discharge		
8	Chen et al., 2020	cross-sectional, survey-based study	China	N = 20 Age range: 23-68 F:68	2 months after outbreak	The Global Severity Index (GSI): 1.56+-0.35, Positive Symptom Total (PST): 36.25+-20.25 Positive Symptom Distress Index (PSDI):2.34±0.34	This study showed that COVID-19 survivors suffered severe somatization, obsession-compulsion, inter-per-sonal sensitivity, anxiety, anger-hostility, paranoid ideation, psychoticism, and highest PST score which meant they had worse psychological status

No	Author	Study design	Country	Sample characteristics	Follow up duration	Measurement tools/Result	Findings
9	Daher et al., 2020	Case series	Germany	N=33 Age Range (Mean): 64 F: 11	6 weeks	Depression (PHQ-9): 7 [4-11] Anxiety (GAD-7): 4 [1-9]	There were no indicators for depression or anxiety
10	Daher et al., 2021	Uncontrolled observational study	Germany	N=18 Age Range (Mean): 61	197 days	Depression (PHQ-9): 72% (minimal to mild) 22% (moderate) 5% (severe)	No significant differences in depression score of patients with type H or L pneumonia. Depression and anxiety do not seem to contribute to patient limitations.
11	de Graaf et al 2021	Cohort study	Netherlands	N = 81 Age range	6 weeks	Anxiety GAD-7:17% Depression PHQ-9: 5% PTSD PCL-5: 10%	Most patients endure mild to moderate psychological limitations. Risk of

		(Mean):60.8 F:30					depression, anxiety and PTSD were similar for both ICU and non-ICU patients

No	Author	Study design	Country	Sample characteristics	Follow up duration	Measurement tools/Results	Findings
12	De Lorenzo et al., 2020	Retrospective and prospective cohort study	Italy	N=185 Age Range (Mean):57.35 F: 62	Mean: 24.05 days after hospital discharge	PTSD (IES-R):22.2% Anxiety (STAI-Y):29.7% Insomnia (WHIIRS):27.6%	Anxiety and PTSD were significantly more frequent in discharged vs. hospitalised patients.
13	Frontera et al., 2021	Prospective cohort study	USA	N=196 COVID-19 cases,186 control group Age range (Median):68 F:238	Median: 6.7 months	Neuro-QoL scale (worse anxiety 46%, sleep 38%, fatigue 36%, and depression 25%).	Neuro-QoL T-scores for anxiety, depression, fatigue and sleep were also similar between both groups.
14	Garrigues et al., 2020	Cohort study	France	N=120 Age range (Mean): 63.2 F:45	Mean: 110.9 days	Anxiety, Depression (EQ-5D-5L): Ward:0.86 (0.19) ICU:0.82 (0.21) Insomnia (short phone	Anxiety and PTSD being significantly more frequent in patients admitted to the ICU. Insomnia is significant in both acute and chronic stages.

No	Author	Study design	Country	Sample characteristics	Follow up duration	Measurement tools/Results	Findings
						questionnaire): 37 (30.8)	
15	Gonzalez et al., 2021	Uncontrolled observational study	Spain	N = 62 Age range (Mean):60 F: 16	3 months after discharge	Depression: HADS-D : 15.2%	The levels of anxiety and depression scores were higher than the reference values.
16	Guo et al., 2020	Cross sectional study	China	N =103 Age range (Mean):42.50 (Patient Group). 41.45 (Control Group) F:46	N/A	Depression PHQ-9 (Mean): Patient/ Control: 5/2. Anxiety GAD-7 (Mean): Patient/ Group: 5/0 Stress PSS-10 (Mean): patient/ control: 13/13 PTSD PCL-5 (Mean): patient/control: 8/4	Depression and anxiety symptoms were more common among COVID-19 patients than in normal controls.

No	Author	Study design	Country	Sample characteristics	Follow up duration	Measurement tools/Results	Findings
17	Halpin et al., 2021	Cross sectional study	UK	N=100 Age Range: (ICU, 58.85), (Ward, 60.61) F: (ICU, 13),(Ward, 33)	48 days after hospital discharge	Anxiety, Depression (EQ-5D-5L): ICU-37.5%, Ward- 16.2% PTSD: ICU-46.9% Ward- 23.5%	This study found levels of PTSD symptomology to be twice as high in ICU patients compared to ward patients. There was a clinically significant drop in EQ5D in 68.8% of participants in

							the ICU group and in 45.6% of participants in the ward group.
18	Hassan et al., 2021	Cross sectional study	Bangladesh	N=237 Age range (Mean):41.59 F:27%	N/A	Anxiety GAD-7: 55.7% Depression PHQ-9:87.3%	Nearly half of the study population (47.7%) was suffering from both depression and anxiety.
19	Imran et al., 2021	Cohort study	Dubai	N=103 Age range:20-69 F:33%	30 and 60 days	Generalized Anxiety Disorder-GAD-7:21.4% Patient Health Questionnaire-PHQ-9: 12.7% PTSD Checklist-5 questionnaire:8.7%	There is a high prevalence rate of clinically significant psychological distress among COVID-19 survivors.
20	Ismael et al., 2020	Retrospective cohort study	Brazil	N=895 Age range (Mean):40.79 F:541	Mean: 56.6 days after treatment	Depression (PHQ-9):26.26% Anxiety (GAD-7):22.46% PTSD (PCL-C):17.32% (online assessment, website or phone)	An increased number of COVID-related symptoms were associated with a clinically significant level of depressive, anxiety, and post-traumatic stress symptoms.
21	Jafri et al., 2022	Cross-sectional study	Pakistan	N=70 Age range: 18-60 F:42	N/A	PTSD: Impact of event scale (IES-R): 41.4% Depression: Patient health	High level of post-traumatic stress was seen among participants who recovered from COVID-19, especially

						questionnaire-9(PHQ-9): Mild depression= 38.5%, Moderate depression= 8%, Severe depression=6% Anxiety: Corona anxiety scale (CAS): 25.7%	those patients who were young, had comorbidities, symptomatic COVID-19 and female gender.
22	Kamal et al., 2020	Cross sectional study	Egypt	*N* =287 Age range (Mean): 32.3 F: 184	20 days after last negative test	Anxiety 38%, depression 28.6%, obsessive-compulsive disorder 4.9%, (data collection questionnaire)	It was noted that many manifestations are related to the central nervous system such as continuous headache, migraine, depression, anxiety, and obsessive-compulsive disorder.
23	Kang et al., 2021	Retrospective observational study	Korea	*N* = 107 Age range (Mean): Less than 30 (68.2), 30-49 (17.8), more than 50 (14.0) F:56	1 to 4 weeks	Depression PHQ-9: Severe: 15.6%. Anxiety GAD-7: Moderate: 15.6% Somatic symptoms PHQ-15 Moderate:18.7% PTSD PCL-5: Moderate :3.1%	Prevalence of depression, anxiety and possible PTSD remained similar across the four weeks of observations, though the prevalence of severe depression increased after four weeks of stay. Somatic symptoms seemed to decrease during their stay.

No	Author	Study design	Country	Sample characteristics	Follow up duration	Measurement tools/Results	Findings
24	Latronico et al., 2021	Prospective longitudinal study	Italy	N =114	3,6,12 months	Hospital Anxiety and Depression Scale: HADS Anxiety=9% Depression=10% PTSD=4%	Mental health status was relatively less frequently impaired.
25	Liu et al., 2020	Cross sectional study	China	N=675 Age Range (Mean):53.94 F: 358	Mean: 36.75	Anxiety (GAD-7):10.4% Depression (PHQ-9): 19% PTSD symptoms (PCL-5):12.4%	Half of the sample reported at least mild symptoms of depression and generalised anxiety.
26	Mandal et al., 2020	Cross sectional study	UK	N=384 Age range (Mean):59.9 F:38	4 to 6 weeks after hospital discharge	Sleep Quality (11-point scale) Depression (PHQ2)	Patients graded their overall recovery health as a median (IQR) 90 (75–100) % compared with 100% best health. 4.6% of participants had a PHQ2 score of greater than 3 indicating significant depression.
27	Mattioli et al., 2021	Prospective cohort study	Italy	N=120 (COVID subjects), 30 (non-COVID subjects) Age range (Mean):47.9	Mean: 126 days from diagnosis	Depression DASS-21 anxiety: Covid subjects: 3; 0-18, Non-Covid subjects: 1; 0-9. DASS-21 stress: Covid subjects: 7, 0-32, Non -Covid subjects:4; 0-15	Anxiety, stress and depression scores were significantly higher in COVID-19 compared with non COVID-19 subjects.

				F: 90 (COVID subjects), 22 (non-COVID subjects)		DASS-21 depression: Covid subjects: 3; 0-30, Non -Covid subjects: 1; 0-13	
28	Mazza et al., 2021	Uncontrolled observational study	Italy	N = 226 Age range: 26-87 F: 76	3 months	PTSD (PCL-5): 13% Depression (BDI-13): 9% Depression (ZSDS): 28% Anxiety (STAI-Y): 30% Insomnia (WHIIRS): 24%	COVID-19 survivors remain clinically depressed three months after hospital discharge while other symptoms probably more related to acute psychological stressors such as PTSD, insomnia, and anxiety decrease over time.
29	Mazza et al., 2020	Prospective cohort study	Italy	N= 402 Age Range (Mean): 57.80 F:137	1 month	PTSD (PCL-5, IES-R): 28% Depression (ZSDS, BDI-13): 31% Anxiety (STAI-Y): 42% Sleep Problem (MOS-SS): 40% Obsessive-Compulsive (OCI): 20%	COVID-19 survivors presented a high prevalence of emergent psychiatric sequelae, with 55% of the sample presenting a pathological score for at least one disorder.
30	Mei et al., 2021	Cohort study	China	N= 4,172 Age Range (Mean): 144 days after discharge F:54.1%	N/A	Patient Health Questionnaire- (PHQ-9): (14.2%) Generalised Anxiety Disorder (GAD-7):(12.2%)	This follow-up study documents that mental health problems among COVID-19 survivors in Wuhan are significantly more common than in the general population of the Hubei province.
31	Mendez et al., 2020	Prospective cohort study	Spain	N = 179 Age range (Mean):57.7 F:74	2 months after hospital	Anxiety (GAD-7): (29.6%) Depression (PHQ-2): (26.8%) PTSD (DTS): (25.1%)	The findings reveal a considerable prevalence of psychiatric comorbidity in COVID-19 survivors after the acute phase, even in noncritically ill patients.

					discharge	

No	Author	Study design	Country	Sample characteristics	Follow up duration	Measurement tools/Results	Findings
32	Morin et al., 2021	Uncontrolled observational study	France	*N*=177 Age Range(Mean):56.9 F: 65.6%	Median of 125 days after hospital discharge	Anxiety- HADS: Non-Intubated: 33.6 Intubated: 26.0 Depression-BDI: Non-intubated 21.7 Intubated: 18.0 Insomnia -ISI: Non-Intubated: 57.6 Intubated: 44.0 PTSD (PCL-5): Non-Intubated: 16.0 Intubated: 10.0	In ICU patients, anxiety, depression, and significant posttraumatic symptoms were observed
33	Mowla et al., 2021	cross sectional comparative research.	Iran	*N*=129 Age Range: more than 65 F: 74	2 weeks after discharge	GAS-10: Geriatric Anxiety Scale-; GDS-15: Geriatric Depression Scale. Results: Covid-19 survivors / control group	This study revealed that both elderly COVID-19 survivors and the controls had high rates of depression and anxiety symptoms during the pandemic.

						GAS-10 > 12 (severe):46.6%/6.6% GAS-10 = 10-11(moderate):26.6%/13.3% GAS-10 = 7-9 (mild):20%/40% GDS-15 > 10(severe):26.2%/6.5% GDS-15 =6-10(mild):60.4%/40.1%	
34	Naidu et al., 2021	Cohort study	UK	*N*=946 Age range (Mean):60.7 F:203	Median of 65 days	Depression: PHQ-2 (13.8%) PTSD: TSQ (10.5%)	The study demonstrated adults with pre-existing depression and anxiety were likely to have positive PHQ-2 and TSQ at follow-up. Psychiatric ill-health at follow-up was associated with persistent physical symptoms such as breathlessness and myalgia. There was no association between severity of acute COVID-19 infection and psychiatric morbidity at follow-up.
35	Ortelli et al., 2021	Case control	Italy	*N* = 12 Age range (Mean): 67 F:2	Mean of 11.5 weeks	Beck Depression Inventory (BDI) : Patients: 3.8 (2.9),	BDI scores were significantly higher in post-COVID-19 patients than in HC. However, no patient had evidence of

| | | | | Control Group: 0.0 (0.0). Apathy Evaluation Scale (AES) Patients: 39.3 (13.7) Control Group: 18.9 (1.0) | major depression, and only five reported BDI scores compatible with minor depression. With regard to neuropsychiatric symptoms, both AES and BDI showed significantly higher scores in patients than in HC (p < 0.001 each). |

No	Author	Study design	Country	Sample characteristics	Follow up duration	Measurement tools/Results	Findings
36	Park et al., 2020	Case series	Korea	N=10 Age Range (mean): 62.6 F: 2	1 months	Depression (PHQ-9):≥ 10 Anxiety (GAD-7):≥ 10 PTSD (IES-R-K):≥ 25	There were no significant differences in the scores for depression, anxiety, or PTSD by pneumonia severity. The results that some of the survivors might have experienced mental health problems
37	Poyraz et al., 2021	cross-sectional survey study	Turkey	N=284 Age range (Mean):39.7 F:49.8%	Median: 50 days from diagnosis	(HADS) Anxiety Score : 6.2 (4.6) Depression score: 6.3 (4.3) PTSD: (IES-R): 5.9 (5.2)	Patients with COVID-19 are prone to substantial psychological distress after the infection. PTSD symptoms and comorbid depression, as well as anxiety, and impaired sleep comprise a substantial part of

No	Author	Study design	Country	Sample characteristics	Follow up duration	Measurement tools/Results	Findings
							the distress described by these individuals.
38	Rass et al., 2021	Uncontrolled observational study	Austria	N=135 Age range (Median): 56 F:53	Median : 102 days from diagno sis	Depression: HADS-D : 11%	Anxiety and depressed mood, sleep disorders, and PTSD were found in a considerable number of patients.
39	Taquet et al., 2021	retrospective cohort study	USA	N = 236 379 Age range (Mean): 46 F: 131 460	6 months	TriNetX electronic health records network: Neurological or psychiatric diagnosis was 33·62%	The present data show that COVID-19 is followed by significant rates of neurological and psychiatric diagnoses over the subsequent 6 months.
40	Tanriverdi et al., 2021	cross-sectional study	Turkey	N = 48 Age range: 18 and 65 years F:54.2%	12 weeks	Anxiety (HADS-A):33.3% Depression (HADS-D):29.2%	The main findings of this study indicated that a considerable proportion of post-COVID-19 patients suffered from anxiety, depression.
No	Author	Study design	Country	Sample characteristics	Follow up duration	Measurement tools/Results	Findings
41	Tarsitani et al., 2021	cohort follow-up study	Italy	N=115 Age Range(Median):57 F:	3 months	PTSD (PCL-5):10.4%	One out of five patients hospitalised for COVID-19 was diagnosed with PTSD

42	Tomasoni et al., 2021	Cross sectional study	Italy	N=105 Age range (Mean):54.29 F:28	3 months	HADS- A/D: Anxiety 29% and Depression 11%	A considerable proportion of COVID-19 patients still experienced psychological distress after hospital discharge.
43	van den Borst et al., 2021	Prospective observational study	Netherlands	N=124 Age range (Mean):59 F:40%	Mean: 9.1 weeks after discharge	Depression HADS-D: 12%	Approximately one-third of the patients in our cohort had abnormal outcomes on mental status, 3 months after COVID-19.
44	Venturelli et al., 2021	Cohort study	Italy	N = 767 Age range (Mean): 63 F: 252	Median: 81 days after discharge	PTSD (IES-R) :30.5 (HADS) Depression: 4.5 Anxiety:11.3	A large proportion of survivors of COVID-19 from our setting had significant ongoing health and psychosocial needs.
45	Weerahandi et al., 2020	Prospective cohort study	USA	N =152 Age range (Mean):59.54 F:57	Mean: 36.64 days after hospital discharge	Overall and mental health status (PROMIS Global Health-10 instrument) Survey completed by phone or online:47.3	Patients with severe COVID-19 disease typically experience sequelae affecting their mental health for at least several weeks after hospital discharge.

No	Author	Study design	Country	Sample characteristics	Follow up duration	Measurement tools/Results	Findings
46	Wu et al., 2020	Case series	China	N=370 Age range (Mean):50.5 F:167	Mean: 24.1 days after hospital discharge	Anxiety (GAD-7): 13.5% Depression (PHQ-9):10.8% Sleep problem (single question): 29.5%	In summary, about 10% of COVID-19 survivors develop anxiety or depression, because of post-discharge residual respiratory symptoms, worry about recurrence, and infection to others. Female COVID-19 survivors are more susceptible to depression.
47	Xiong et al., 2021	Prospective cohort study	China	N=538 Age range (Mean):51.64 F:293	Mean: 98.05 days after hospital discharge	Psychosocial symptoms 122 (22.7%) Depression 23 (4.3%) Anxiety 35 (6.5%) Dysphoria 9 (1.7%) Feelings of inferiority 3 (0.6%) Sleep problems 95 (17.7%)	Findings shows that there was psycho-social symptoms suggesting that these symptoms may indeed be the sequelae of recovery for COVID-19 survivors. Significantly higher than in the comparison group
48	Xu et al., 2021	Cohort study	China	N=121 Age range (Mean):41.72 F:52	2 weeks after discharge	Centre for Epidemiology Scale for Depression (CES-D): 9.92%	COVID-19 recovered patients had a low rate o f depression

No	Author	Study design	Country	Sample characteristics	Follow up duration	Measurement tools/Results	Findings
49	Yuan et al., 2020	Retrospective cohort study	China	*N* =226 Age range: N/A F: N/A	14 days after hospital discharge	Zung self rating depression scale: 43%	Patients that have been cured from COVID-19 generally remain anxious and depressed, even after they are discharged from the hospital.

Discussion

Main findings of the reviews are mental health of patients' scores using HADS found to have abnormal mental status among survivors. Majority of the assessment with HADS was done one month after infection except one prospective longitudinal study done at 3, 6 12 months shows mental health status was relatively less frequently impaired.

The reasons for these differences are likely to be multifactorial. One of the factors could be to follow up therapies given to mental health problems and also due to limitation of the study i.e. single centre study, which may not be generalizable. However, nine other studies confirmed high anxiety, depression and PTSD scores. In these studies participants consisted of patients admitted to ICU both intubated and non -intubated patients (Morin et al., 2021). Moreover, these studies were uncontrolled cohort studies with no comparison against control groups (Morin et al 2021; Gonzalez et al., 2021; Rass et al., 2021) and these survivors had prior psychiatric disorders (Poyraz et al., 2021). The common factors causing impact were age, gender, severity of illness and comorbidity.

All reviewed studies using PTSD tools were mainly on Long covid (> 4 months) using PTSD tools studies found that there were considerable prevalence rate of PTSD among hospitalized and discharged patients (Chang et al. 2020; De Lorenzo et al., 2020) Covid-19 survivors remain clinically depressed 3 months after hospital discharge (Mazza et al., 2021; Tarsitani et al., 2021). In an earlier study by Mazza et al., (2020), Covid-19 survivors presented a high prevalence of emergent psychiatric squeal, this was further established by Mendez et al., (2020) that considerable prevalence of psychiatric comorbidity in Covid-19, survivors after the acute phase even in non- critically ill patients. There was also worrying novelty found in Bellan et al., (2021) study using PTSD tool, whereby male gender was the only independent factor associated with PTS symptoms. Besides that, de Graaf et al., (2021) (using PSTD tool) reported that the risk of depression and anxiety were similar for both ICU and non-ICU patients.

Unlike shown, studies also produce results that were contrary to the above results Liu et al., (2020) have reported half of the sample had at least mild symptoms of depression and generalized anxiety. In another study by Park et al. (2020), resulted that some of the survivors might have experienced mental health issues. This short review about the assessment using PTSD shows in some studies that high prevalence psychological distress remains similar across four weeks and even increases after 4 weeks (Kang et al., 2021) and at the same time other studies show only mild symptoms presented. The disparity could be explained by looking at the limitations of these studies. The study by Park et al. (2020) has its own limitations i.e. the research presented with only preliminary results and it consist of small sample size and respondents that did not require ventilator treatment. Besides that, the participant has no major complications.

In Liu et al. (2020) the author has speculated sample bias which the author has explained that the possible non-Chinese sample could produce different patterns of mental illness. Besides that there may be Berkson's bias that could produce validity issues. Moreover there could be a missed out of important risk factors in the questionnaire. Furthermore, the respondents were not critically ill patients and did not investigate for any medical comorbidity. At the same time the study did not screen for pre-existing mental health symptoms before data collection.

In reporting PHQ based assessment studies, the mental health issues were significant in almost all studies. Percentage of mild mental health issues reported were 0- 72% (Jafri et al., 2022; Daher et al., 2020; Liu et al., 2020) meanwhile, moderate cases were 22% (Jafri et al.,

2022, Daher et al., 2021). Overall 27 % (depression), 30 % (anxiety), 25% (PTSD was reported in the studies that use PHQ. From the figure above, it was clear to note that there were more mild cases compared to moderate and severe cases, at the same time there is a fair distribution of percentage among depression, anxiety and PTSD. Moreover, low income countries have shown high prevalence of mental health issues (Park et al., 2020) compared to high income countries.

Studies using GAD assessment tools are mainly conducted using cross sectional, cohort study and case series. Overall, scores for these research designs have some differences. Study GAD in cross sectional study (Hassan et al., 2021) shows 55.7% of anxiety among 237 patients. The study by Liu et al., (2020) (Wuhan) shows only 10.4% among 675 discharged patients. The factors that has contributed to the results was higher disease severity, living with children, death of family members from Covid-19, higher total number of symptoms after discharge and finally target of discrimination. Unlike the contributing factors in (Liu et al., 2020) study (Hassan et al., 2021) show half of the patients in the study were unemployed and 90 % of them were living in urban areas.

As in cohort study, 3 studies (n= 4,356) show anxiety of 17% (de Graaf et al., 2021), 21.4% (Imran et al., 2021), 12.2% (Mei et al., 2021) respectively. These figures show that there are no large disparities and notably belong to high income countries. Similarly, when the data was analysed based on acute and Long Covid, the results showed that Long Covid shows less percentage of anxiety than acute Covid (Imran et al., 2021), Long Covid (60 days) (9.5%), acute (30 days) (21.4%).

In the study by Chen et al. (2020), 20 Covid -19 survivors were assessed by GSI, PST, and PSDI and found to have the highest assessment scores. This means these survivors had worse psychological issues due to isolation in hospitals, despair, humiliation and loneliness. Similar findings were found in (Mazza et al., (2020) assessed at 1 month and Mazza et al., (2021) assessed at 3 months) (Total n= 628) . Both used prospective cohort and uncontrolled observational study respectively. These studies were assessed using STAI-Y (30%- 42% anxiety) and BDI-13 (9%- 31% depression) meanwhile ZSDS (28% - 31% depression). In summary both studies indicate Covid -19 survivors clinically depressed after hospital discharge.

Another similar study by De Lorenzo resulted in significant anxiety and PTSD (STAI-Y= 29.7%) in discharged patients vs hospitalized. The same results were found when using the Zung self-rating scale, the depression rate was 43% (Yuan et al., 2020). A study done in ICU patients, measured by EQ-5D-5L shows anxiety, PTSD are more frequent in ICU patients (Garrigues et al., 2020). Halpin et al., (2021) also shows frequent PTSD symptoms and in fact is twice as high in ICU patients compared to ward patients. Post-traumatic stress assessment, in Jafri et al., (2022) have resulted especially in young, female gender, comorbid, symptomatic Covid-19 by using CAS. In contradicting results in Xu et al., (2021) show patients had a low rate of depression using CES- 9.92% investigated 2 weeks after discharge. The reasons behind the low depression rate in subjects were that they had mild symptoms, short hospitalization period, prompt and effective treatment given.

Contrary to the above study, Molwa et al., 2021, investigated depression and anxiety rate in elderly (more than 65 years of age) after 2 weeks of discharge. Both confirmed Covid-19 (n=69) and control group (n=60) were selected for the study. Geriatric Depression Scale (GDS-15) was administered to the subjects. The outcome shows both groups suffered high rates of depression and anxiety symptoms during the pandemic period. Another study by Kamal et al., (2020), reveals that post Covid-19 manifestation shows 28.6% of depression and

38% anxiety in 287 Covid -19 survivors (Mazza et al., 2021). When investigated between survivors and control groups, Frontera et al. (2021), using Neuro QoL shows 46% of anxiety and 25% of depression was the same between both groups. But in Mattioli et al. (2021), study using DASS, the result in this study shows anxiety, stress, and depression scores were significantly higher in Covid -19 (n=120) compared with non- Covid -19 (n=30) subjects. The same result was shown by Ortelli et al. (2021), using BDI. In line with this result, there was significant higher depression and anxiety in Covid -19 survivors (Xiong et al., 2021).

The strength of this review include:

1.   This is the first type of review paper which deals with mental health issues in a structured way based on instruments used.

2.   Using PRISMA guidelines as a means to select papers

3.   We reviewed almost 48 papers which related to Covid-19 survivors.

While having the strength, we do also have some limitations.

1.   All papers are published in the English language only.

2.   We included papers that used data collection questionnaires which is questionable in relation to validity (Kamal et al)

3.   We excluded papers that investigated the general population with other disease groups.

4.   We did not mention the validity of the measurement used in these studies.

Conclusion

We concluded that the impact of mental health issues remain even after discharges from hospital. As mental health symptoms still linger among survivors, it has in some cases emerged as a psychiatric sequel. However, the anxiety, depression and PTSD issues may have contributed from other factors i.e. age, comorbidity, ICU admission, female gender and low income countries. Low health related quality of life, sleep deprivation and stigmatisation may proceed with Long Covid. With few comparison studies done, future study may warrant such comparisons to detail out clearer impact.

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