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Respiratory and functional outcomes among severe COVID-19 infection survivors: a prospective observational study

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Abstract

Patients who have severe to critical COVID-19 infection may experience persistent or new symptoms after discharge. Our objective is to determine the first-year post-discharge respiratory and functional outcomes in patients who survived COVID-19 infection. In this prospective and observational study, we recruited Malaysians above 18 years old who survived severe or critical COVID-19 and followed them up for 1 year. Patients completed the post-COVID-19 Functional Status (PCFS) scale, performed the 6-minute walk test, and a standard spirometry. In the final analysis, 94 patients were included. Median age was 57 years (24,86); 55 (57.3%) were men, and 20 (20.8%) required invasive ventilation. Overall, 45 (46.9%) had underlying hypertension, 33 (34.4%) had diabetes mellitus, 43 (44.8%) had hospital-acquired infection, 19 (19.8%) had raised liver enzymes, and 17 (17.7%) suffered pulmonary embolism. From discharge to 1 year following discharge, the percentage of patients with dyspnea reduced from 51.4% to 25.0%, while patients with cough reduced from 16.2% to none, and fatigue from 20.0% to 12.5%. The percentage of patients with PCFS of 0 increased from 48.0 to 62.5%, while no more patients reported PCFS scales of 3 or 4 after 24 weeks. The median 6-minute walk distance within 1 to 8 weeks was 375.0 m (108.0, 540.0). This increased to 500.0 m (330.0, 680.0) at 41 to 48 weeks. Throughout the follow-up, the percentage of patients with normal spirometry findings increased from none at 1 to 8 weeks to 43.8% at 41 to 48 weeks. In conclusion, patients gradually regained their functional status. Follow-up for patients with persistent symptoms and abnormal spirometry is necessary to determine their long-term outcome.

Key words: post-COVID-19 syndrome, long COVID, post-acute sequelae of SARS-CoV-2 infection, post-acute COVID-19 sequelae.

Introduction

On 11 March 2020, World Health Organization (WHO) declared the coronavirus disease 2019, or better known as COVID-19, as a pandemic. While most patients had mild disease, around 20-30% of patients developed severe to critical illness [1-4].

After discharge from the hospital, patients may experience persistent or new symptoms, e.g. breathlessness, excessive fatigue and limitations in physical activities [5]. The symptoms could develop from physical and cognitive impairments after an episode of acute respiratory distress syndrome (ARDS), or because of post-thrombotic/pulmonary embolism syndromes [6-9]. Sequelae from COVID-19 infection like pulmonary fibrosis has been postulated to cause those symptoms [10]. Those with lung complications may have a variety of lung function test abnormalities such as restrictive spirometry, low total lung capacity (TLC) and reduced diffusion capacity for carbon monoxide (DLco) [5,11].

In Malaysia, the incidence of COVID-19 infection increased rapidly from July 2020 and only began to recover in April 2022 [12]. Our objective was to determine the respiratory and functional outcomes within the first-year post-discharge among adult survivors of severe to critical COVID-19 infection. In this article, we report the results from 48 weeks follow-up.

Materials and Methods

Study setting

This prospective and observational study was conducted between 1st November 2021 and 30th April 2023 at the post-COVID-19 clinic, Institut Perubatan Respiratori (IPR) in Kuala Lumpur, Malaysia. This clinic accepted referrals of patients who survived severe to critical COVID-19 infection from hospitals in the Klang Valley region.

Study populations and procedures

All patients who were referred to IPR within the study duration were considered for the study. We included Malaysians aged 18 years or more, who had confirmed COVID-19 infection with a positive Rapid Test Kit Antigen (RTK-Ag) and/or a positive molecular test (reverse transcription-polymerase chain reaction, RT-PCR or rapid molecular). Patients who understand neither Malay nor English were excluded.

We defined COVID-19 disease severity according to the Clinical Management of Confirmed COVID-19 Case in Adult and Paediatric Populations [13]. Patients who were from category 4 and 5 were deemed to have severe and critical COVID-19 disease respectively. Patients were further classified into category 4a if they required nasal prongs or face mask, category 4b if they required high flow mask, category 5a if they needed non-invasive ventilation (NIV),

including high-flow nasal cannula, and category 5b if they needed mechanical ventilation [13].

In accordance to the Ministry of Health (MOH) Post-COVID-19 Management Protocol, patients were given appointment for full clinic assessment four weeks after discharge, with 6-minute walk test (6MWT) [14]. Follow-up dates were set according to subjects' clinical symptoms and clinic slot availability. Participants were followed up for one year with face-to-face reviews. They completed the post-COVID-19 Functional Status (PCFS) scale during every consultation. Spirometry and 6MWT were done at 6 and 12 months post-COVID-19 or if clinically indicated.

Patient characteristics

Outcome measures were post-COVID-19 infection symptoms and respiratory outcomes during the first 12 months after infection.

Demographic data, medical co-morbidities and admission details like duration of admission, presenting complaints, and COVID-19 category were obtained from medical records. Follow-up interviews on symptoms and functional status were done face-to-face.

The co-morbidities were scored into the Charlson Comorbidity Index (CCI) [15]. Patients' weight and height were measured during the first clinical assessment. Their vaccination status was obtained from their MySejahtera mobile application, developed by the Malaysian government to assist in management of the COVID-19 outbreak.

Research tools

Objective measurement of symptoms were done using two research tools; the Post-COVID-19 Functional Status (PCFS) Scale, and the 6-minute walk test (6MWT).

The PCFS scale is an adaptation from the post-venous thromboembolism functional status (PVFS) scale [16]. It was used to assess the functional limitations and changes in lifestyle and social activities [17]. The PCFS scale ranges from 0 to 5. Grade 0 reflects the absence of functional limitations. From grade 1 to grade 4, functional limitations exist to an increasing degree. Grade 5 signifies the death of a patient. This tool is in English. It has a flowchart with four questions, and a table with five statements (*Appendix 1*). The PCFS scale grade was obtained from responses to both the flowchart and statements. If the responses lead to different grades, the higher grade with the most limitations were taken for analysis [16]. Patients scored their functional status during follow-up reviews.

The 6MWT was used to measure patients' functional capacity [18]. A trained physiotherapist performed the 6MWT and recorded the 6-minute walk distance (6MWD) in a standard

reporting form, from which the data was extracted. We calculated the difference between the first and last tests if patients had two or more tests.

Standard spirometry was performed during follow-up and reported according to Official American Thoracic Society and European Respiratory Society Technical Statement (2019) [19].

Sample size

Considering the number of active cases of about 150,000 at the time of research planning, the number of patients who were severe to critically ill with COVID-19 was estimated to be around 37,500 (25% of total number of active cases). According to sample size table based on Krejcie and Morgan Sample Size Calculation, 400 patients should be sufficient for analysis [20]. However, in anticipation of 30% dropouts throughout the study period, we planned to recruit 520 subjects. All patients who fulfilled inclusion criteria and agreed to participate were recruited into the study.

Statistical analysis

We used IBM SPSS Statistics version 27 to analyse data. Categorical data were described as frequencies and percentages. Continuous data were expressed as median (range).

Results

The post-COVID-19 clinic received 320 new patients within the study period. One hundred patients agreed to participate in the study. Based on the inclusion criteria, four patients were dropped, and two patients had no documented discharge date. In the final analysis, 94 were included.

From 94 patients, five (5.3%) were last seen between 48 to 52 weeks after discharged from hospital, 16 (17.0%) were last seen between 41 to 48 weeks, and 73 (77.7%) were last seen before 41 weeks. Twenty-four (25.5%) continued follow-up beyond 52 weeks. The median (range) first review was at 15 (2-33) weeks. The median (range) last review was at 30.5 (4-52) weeks. Figure 1 shows the flow chart of patients seen in the post-COVID-19 clinic. During recruitment period, the COVID-19 situation in Malaysia had started to improve, with 80% of the population being fully vaccinated, and intensive care unit (ICU) occupancy with COVID-19 patients reduced to 40% [21]. Therefore, only 320 patients were referred to the post-COVID-19 clinic within this period. From these patients, 100 patients agreed to participate in the study. Within the follow-up period, 50 were lost to follow-up, and 17 were discharged by physicians before end of planned follow-up.

The demographic characteristics of patients are presented in Table 1, and their clinical characteristics are presented in Table 2. The median (range) age of patients who had severe to

critical COVID-19 infection was 57 (24-86) years old. Fifty-five (57.3%) of them were males, and 70 (72.9%) were Malays. Twenty-five (26.0%) of the patients were either current or ex-smokers, 24 (96.0%) of them were male.

The median (range) age-adjusted CCI was 2 (0-7). Common co-morbidities were hypertension, accounting for 45 (46.9%) of all patients, followed by 33 (33.4%) with diabetes mellitus, 27 (28.1%) with obesity and 23 (24.0%) with dyslipidaemia. Median (range) body mass index (BMI) was 28.7 (17.9-49.6). Fifty-one (53.1%) of the patients had two doses of COVID-19 vaccine prior to admission, 10 (10.4%) had one dose of the vaccine, and 28 (29.2%) were not vaccinated.

Most patients presented with fever (77, 80.2%), 69 (71.9%) presented with cough, and 56 (58.3%) presented with dyspnoea. In terms of COVID-19 category, 28 (29.2%) were in category 4a, 15 (15.6%) were in category 4b, 33 (34.4%) in category 5a, and 20 (20.8%) in category 5b. The most common complications were hospital-acquired infection (43, 44.8%), raised liver enzymes (19, 19.8%), pulmonary embolism (17, 17.7%), and acute renal failure (14, 14.6%).

The median (range) of hospital stay is 14(4-120) days. Thirty (40.5%) of the patients were referred to a rehabilitation service upon discharge from the hospital, including 14 (14.6%) to physiotherapists, 2 (3.1%) to both physiotherapists and occupational therapists, and 10 (10.4%) to specialist rehabilitation services. Six (6.3%) patients were discharged with oxygen.

During follow-up period, 25 patients were reviewed within the first 8 weeks after discharge, 37 were seen between 9 to 16 weeks, 34 between 17 to 24 weeks, 44 between 25 to 32 weeks, 19 between 33 to 40 weeks, and 16 between 41 to 48 weeks. Table 3 describes the post-discharge symptoms and investigation results.

In the first 8 weeks post-discharge, 10 (40.0%) of patients had dyspnoea, 7 (28.0%) had cough, 4 (16.0%) of them complained of myalgia, and 5 (20.0%) complained of fatigue. Among those seen within 41 to 48 weeks, patients who had dyspnoea reduced to 4 (25.0%), none of the patients complained of cough, 1 (6.3%) had myalgia, and 2 (12.5%) had fatigue.

New complaints in the first 8 weeks follow-up include disturbed sleep (2, 8.0%), nightmares (2, 8.0%), feeling anxious (2, 8.0%), and low mood (1, 4.0%). From those seen between 41 to 48 weeks, only one patient complained of disturbed sleep and low mood, while no one complained of other symptoms.

In terms of functional status, the number of patients who had PCFS scale of 0 increased from 12 (48.0%) in the first 8 weeks to 22 (64.7%) within 17 to 24 weeks follow-up. A higher percentage of patients had reported PCFS scale 0 within the first 8 weeks post-discharge, compared to scale 1 (20.0% difference). The difference between PCFS 0 and 1 was the highest within 33 to 40 weeks, which was 57.9%.

The median (range) 6MWD was 375.0 (108.0-540.0)m within the first 8 weeks and 500.0 (330.0-680.0)m when performed within 41 to 48 weeks. The mean change of 6MWD in patients who had repeated tests was 41.7m.

There were 64 spirometry measurements throughout the 48 weeks of study; 18 of them came from nine patients who had it measured twice. The number of patients with normal spirometry results increased from no patients in the first 8 weeks post-discharge to 7 (43.8%) when performed within 41 to 48 weeks.

Percentage of patients requiring rehabilitation services decreased from 32.0% in the first 8 weeks to 24.3% in the 9 to 16 weeks post-discharge. By 48 weeks, only two (12.5%) patients needed these services.

Sixty (63.8%) patients were last seen in the post-COVID-19 clinic at less than 41 weeks; 48 (80.0%) of them were lost to follow-up, and 12 (20.0%) were discharged by physician. Among those who were lost to follow-up, 29 (60.4%) reported PCFS scale 0 during their last review, and 7 (14.6%) reported PCFS scale 1. Meanwhile, 11 (91.7%) of those discharged by physician had PCFS scale of 0. Twenty-four (25.5%) patients were scheduled to be seen in the respiratory clinic beyond 52 weeks of study duration.

Discussion and Conclusions

Our study demonstrated that symptoms and functional status improved with time after discharge from hospital. The median 6MWD increased between the first two follow-ups and reached a median value of 500m by 41 to 48 weeks. Although restrictive spirometry pattern decreased in the first two follow-ups, some patients still had restrictive changes at 41 to 48 weeks. A quarter of the patients were still seen in the respiratory clinic beyond one year post-discharge.

Only a third of all available patients agreed to participate in the study. The busy nature of a specialist respiratory clinic may have not allowed physicians to approach all available patients for participation. In addition, since this is an observational study, the patients may not be willing to participate in the study as they could not see any potential medical or financial benefit for themselves. Previous studies have shown that there is lower willingness among potential participants to take part in a study if there is no perceived potential for their own benefit, and when there is no need for alternative treatment options [22,23]. Knowing that the results of the study may benefit others, or that they may contribute to scientific knowledge, were not found to encourage patients' decisions to take part in a study [23].

A large percentage of patients in this study were lost to follow-up. Three-quarter of patients who were lost to follow-up before 41 weeks reported good functional status during their last review. Attrition in this study may be due to symptom improvements, or difficulties attending

their scheduled follow-up for various reasons, including work commitments, transport issues or distance from home. They may also have clinic follow-up at other centres, seeing that almost half of them have underlying hypertension.

A local study have shown that patients may be lost to follow-up as they were seen in other centres, no longer being interested in the research, and occupied with work or house chores [24]. Another study on loss to follow-up mentioned that patients stopped coming for hospital appointments due to being busy, having transportation issues, or having minimal symptoms [25].

The median age of participants in this study is within similar range compared with other studies. Two studies reported higher median age of 64 and 60.5 years old, while some other studies reported lower median age of 53.7 and 48.8 years old [26-29]. It is known that severity of illness from COVID-19 infection is higher among older patients. The studies with higher median age reported mMRC dyspnoea scale score of 3 in around 5% of their patients after 12 months [26,27]. The study with a younger median age found that 1.8% had PCFS of 0 in the same duration [29].

Dyspnoea is the commonest symptom reported among COVID-19 infection survivors, with most studies reporting between 13.9 to 58.4% of patients complaining of dyspnoea one year post infection [26,27,30]. A reduction in myocardial performance, persistently reduced DLco, restrictive/obstructive airflow limitations and CT chest abnormalities have been associated with continual breathlessness [31-34]. The presence and severity of dyspnoea may fluctuate in the first two years after COVID-19 infection, and it may last up to five years [30].

Cough is a frequent complaint post-COVID-19. Four studies reported that 18.0 to 65.0% of severe COVID-19 disease survivors experienced cough up to the first three months after discharge, while two studies demonstrated prolonged cough for up to one year after discharge in 10.1 and 35.3% patients respectively [5,26,27,34,35]. Up to this day, there are no known definitive causes for chronic post-COVID-19 cough. A study looking at laryngeal electromyography in post-COVID-19 refractory cough reported that 76.3% of the patients had pathological findings, with almost two-thirds demonstrating chronic denervation pattern [36]. Another paper postulated that viral neurotropism, sensory nerve involvement and sensory hypersensitivity may have a role in refractory cough within this population [37].

It is important to consider exacerbation of a pre-existing lung disease, other bacterial, fungal or tuberculous infections, and other causes of chronic cough during investigation of refractory cough in these patients [38].

While fatigue and myalgia affected some patients in our study, the numbers are higher in other studies. Four studies reported that 40.0 to 67.8% of patients complained of fatigue, and two studies reported presence of myalgia in 30.0 to 46.6% of patients within three months post

infection [5,27,34,35]. Meanwhile, two studies reported presence of fatigue in 31.8 and 52.3% of patients and myalgia in 34.8 to 35.2% of patients after one year [26,27,39].

Our study showed a lower number of patients with PCFS scale of 1 and above compared with other studies. A study demonstrated that 93.7% of patients had PCFS scale of 2 to 3 at three months post infection, while another showed increasing number of patients with lower PCFS scale over one year [29,40]. The increase of 6MWD seen in our study is comparable to other studies, of which one study showed improvement of 6MWD throughout 12 months follow-up, and others demonstrated higher 6MWD within two to four months post discharge [39-42]. Compared with these three studies, our patients have higher median BMI, higher CCI, and we have double the number of patients with underlying hypertension, which may have contributed to the lower 6MWD within the same duration.

While our study found that more patients had restrictive lung changes, spirometry findings vary among other studies. Two studies demonstrated a higher number of patients with obstructive than restrictive patterns albeit with different timing of measurement, another showed similar numbers between the two groups within one-month post COVID-19 [43-45].

The reduction in the number of patients requiring rehabilitation services towards the end of the study follow-up period may reflect the improvement of symptoms among patients in this population. While our patients had outpatient rehabilitation, most studies reported the outcome of inpatient rehabilitation services. These other studies demonstrated significant symptom improvement of dyspnoea, fatigue and functional status among patients who went through inpatient rehabilitation [46-48].

To our knowledge, the strength of this study lies in being the only prospective study of survivors of severe COVID-19 infection in the country. Inclusion of respiratory and functional investigations as its variables added to the strength of this study. The results have shed some light on the outcome of patients who survived severe to critical COVID-19.

This study has several limitations. Since this study was done in a single centre, the findings may not represent other severe COVID-19 survivors in other parts of Malaysia. There were no control populations, for example those who had asymptomatic or mild COVID-19 infection, which could have strengthened the results of this study.

Despite the presence of the Post-COVID-19 Management Protocol, the observational nature of the study made it difficult to regulate the practice and decisions made by attending physicians. Therefore, several missing data were found throughout the study, some patients were not scheduled for the intended investigations, the review timing were inconsistent, and some were discharged long before the end of follow-up duration.

The small number of patients prevented additional data analysis. A larger sample size could have increased the statistical power and generalizability of the study findings.

Therefore, we recommend a multi-centre approach to increase the number of patients. This approach will enable a deeper statistical analysis of post-COVID-19 syndrome, and will be more representative to the Malaysian population.

In general, the study has significant clinical and public health implications. The number of patients with underlying non-communicable conditions like hypertension, diabetes mellitus and obesity seen in this study reflects the general health condition in the country. This warns of high healthcare cost in the future, as these diseases make patients vulnerable to higher complication rates, in not only COVID-19, but also infections like dengue fever and tuberculosis. Large scale public health promotion for primary prevention of these non-communicable diseases is warranted.

In conclusion, patients with severe to critical COVID-19 gradually regained their functional status. Further follow-up of patients with persistent symptoms and abnormal respiratory function tests are necessary to determine the long-term outcome in this population.

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Online supplementary material:
Appendix 1. Post-COVID-19 Functional Status scale. Reproduced with permission from: Klok *et al.* [16].

Table 1. Demographic characteristics of study participants (n=96).

Characteristics	Number, n (%)
Age (years)	
Median (range)	57 (24-86)
Gender	
Male	55 (57.3)
Female	41 (42.7)
Race	
Malay	70 (72.9)
Chinese	20 (20.8)
Indian	5 (5.2)
Others	1 (1.0)
Smoking history	
Never smoked	63 (65.6)
Ex-smoker	21 (21.9)
Current smoker	4 (4.2)
Unknown	4 (4.2)
Age-adjusted Charlson Comorbidity Index on admission	
Median (range)	2 (0-7)
Co-morbidities	
Hypertension	45 (46.9)
Diabetes mellitus	33 (34.4)
Obesity	27 (28.1)
Dyslipidemia	23 (24.0)
BMI (kg/m2)	
Median (range)	28.7 (17.9-49.6)
Vaccination status on admission	
Not vaccinated	28 (29.2)
Partially vaccinated	10 (10.4)
Fully vaccinated	51 (53.1)
Unknown	7 (7.3)

Table 2. Clinical characteristics of study participants (n=96).

Characteristics	Number, n (%)
Presenting complaints	
Fever	77 (80.2)
Cough	69 (71.9)
Dyspnea	56 (58.3)
Myalgia	33 (34.4)
Ageusia	26 (27.1)
Fatigue	25 (26.0)
Anorexia	24 (25.0)
Sore throat	24 (25.0)
Anosmia	21 (21.9)
COVID-19 clinical stage	
Category 4a	28 (29.2)
Category 4b	15 (15.6)
Category 5a	33 (34.4)
Category 5b	20 (20.8)
Duration of highest oxygen requirement	
Median (range)	6 (2-20)
Disease complications	
Hospital-acquired infection°	43 (44.8)
Raised liver enzymes	19 (19.8)
Pulmonary embolism	17 (17.7)
Acute renal failure	14 (14.6)
Decompensation of underlying disease#	5 (5.2)
Acute respiratory distress syndrome	5 (5.2)
Duration of hospital stay	
Median (min, max)	14 (4, 120)
Referral to rehabilitation services	
No referral	66 (68.8)
Physiotherapy only	14 (14.6)
Physiotherapy and occupational therapy	3 (3.1)
Specialist rehabilitation service	10 (10.4)
Referral unspecified	3 (3.1)
Number of patients discharged with oxygen	6 (6.3)

°Hospital-acquired infection includes pneumonia, urinary tract infection, catheter-related bloodstream infection and *Clostridium difficile* colitis. #Decompensation of underlying disease includes acute cardiac failure, acute liver failure and uncontrolled diabetes mellitus.

Table 3. Clinical picture and interventions done within 48 weeks post discharge.

Variables	1 to 8 weeks (n=25)	9 to 16 weeks (n=37)	17 to 24 weeks (n=34)	25 to 32 weeks (n=44)	33 to 40 weeks (n=19)	41 to 48 weeks (n=16)
Common complaints						
Dyspnea	10 (40.0)	19 (51.4)	6 (34.1)	15 (34.1)	2 (10.5)	4 (25.0)
Cough	7 (28.0)	6 (16.2)	5 (14.7)	6 (13.6)	4 (21.1)	0 (0.0)
Fatigue	5 (20.0)	11 (29.7)	9 (26.5)	7 (15.9)	2 (10.5)	2 (12.5)
Myalgia	4 (16.0)	6 (16.2)	2 (2.9)	4 (9.1)	1 (5.3)	1 (6.3)
New symptoms						
Disturbed sleep	2 (8.0)	5 (13.5)	1 (2.9)	2 (4.5)	1 (5.3)	1 (6.3)
Nightmares	2 (8.0)	1 (2.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Low mood	1 (4.0)	1 (2.7)	0 (0.0)	1 (2.3)	0 (0.0)	1 (6.3)
Feeling anxious	2 (8.0)	1 (2.7)	1 (2.9)	1 (2.3)	0 (0.0)	0 (0.0)
Post-COVID-19 Functional Status (PCFS) scale						
Grade 0	12 (48.0)	21 (56.8)	22 (64.7)	31(70.5)	12 (63.2)	11 (62.5)
Grade 1	7 (28.0)	7 (18.9)	2 (5.9)	7 (15.9)	1 (5.3)	3 (18.8)
Grade 2	3 (12.0)	6 (16.2)	1 (2.9)	3 (6.8)	3 (15.8)	1 (6.3)
Grade 3	1 (4.0)	1 (2.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Grade 4	1 (4.0)	0 (0.0)	1 (2.9)	0 (0.0)	0 (0.0)	0 (0.0)
Unknown	1 (4.0)	2 (5.4)	8 (23.5)	3 (6.8)	3 (15.8)	1 (6.3)
6-minute walk distance (m)						
Median (range)	375.0 (108.0-540.0)	467.5 (230.0-650.0)	430.0 (252.0-522.0)	423.5 (200.0-600.0)	430.0 (220.0-600.0)	500.0 (330.0-680.0)
Spirometry diagnosis						
Normal	0 (0.0)	4 (10.8)	5 (14.7)	4 (9.1)	3 (15.8)	7 (43.8)
Restrictive	7 (28.0)	4 (10.8)	9 (26.5)	8 (18.2)	5 (26.3)	8 (50.0)
Rehabilitation services						
None	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Physiotherapy	7 (28.0)	4 (10.8)	3 (8.8)	5 (11.4)	3 (15.8)	2 (12.5)
Occupational therapy	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.3)	0 (0.0)	0 (0.0)
Physiotherapy and occupational therapy	0 (0.0)	2 (5.4)	0 (0.0)	1 (2.3)	0 (0.0)	0 (0.0)
Specialist rehabilitation service	1 (4.0)	3 (8.1)	1 (2.9)	4 (9.1)	0 (0.0)	0 (0.0)

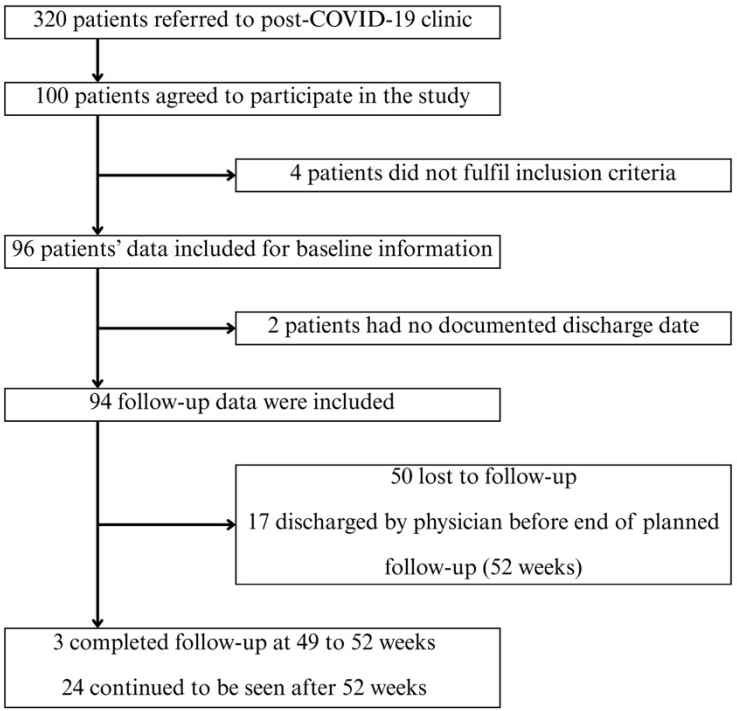

Figure 1. Flow chart of patients seen in the post-COVID-19 clinic.