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Assessment of Persistence Symptoms in Recovered COVID-19 Patients by Yorkshire Rehabilitation Scale (C19-YRS): A Cross-Sectional Study from Qassim Region, Saudi Arabia

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Abstract

Background: Earlier back at the beginning of COVID-19, the acute phase of infection was variable from one patient to another causing different symptoms. However, many patients are still suffering from Post COVID-19 Syndrome. Hence, this study aimed to assess the persistence of symptoms in patients who recovered from COVID-19 in the Qassim Region, Saudi Arabia. **Methodology:** A descriptive cross-sectional study of 413 confirmed PCR test-positive covid-19 patients enrolled in this study from the Ministry of Health Electronic Surveillance System (HESN). The Yorkshire Rehabilitation Scale (C19-YRS) checklist was used to record patients' symptoms, functioning, and disability. Data were analyzed by the SPSS program. Functional and patient-reported outcome measures were correlated with certain items from C19-YRS, the severity of symptoms. Its distribution-based methods were used for responsiveness over time. The scaling and targeting assumptions were satisfied, and internal consistency was high (Cronbach's $\alpha = 0.843$). **Results:** After 4 weeks of infection, 50% of patients reported persistent symptoms such as laryngeal complications, 43.8% Swallowing changes, 31.3% fatigue, 18.8% pain, 18.8% loss of appetite, 12.5% breathlessness, and 6.3% depression, Moreover, 18.8% of patients experienced reduced mobility. At the beginning of the COVID-19 infection, fever was the most common complaint 332 (80.4%), followed by 267 (64.6%) fatigue, and loss of smell 230 (55.7%). The severity of the breathlessness symptoms was exaggerated during the patients' walking or climbing stairs. Patients who were admitted to an intensive care unit (n = 5) were significantly elderly ($P < 0.001$), with chronic diseases ($P < 0.01$) mainly Diabetes Mellitus and Hypertension. **Conclusion:** The study examined the se-

verity of post covid syndrome by patients' responsiveness to the scale items in C19-YRS. The majority of COVID-19 symptoms were still present but significantly reduced after 4 weeks of infection. Follow-up and long-term management of physical and psychological symptoms of hospitalized and non-hospitalized patients are very important.

Keywords

Post COVID-19 Symptoms, Rehabilitation, Outcome Measures, Persistence Symptoms, Qassim Region

1. Introduction

At the beginning of 2020, a Chinese-originated contagious viral infection was rapidly spread worldwide, which was declared by the world health organization (WHO) a global pandemic [1]-[8].

This pandemic has greatly impacted people's lives not only medically but at different levels of communities. Up to date, there are almost one billion confirmed cases and 7 million deaths globally specifically in the Kingdom of Saudi Arabia. More than 800 thousand cases were confirmed and almost 9 thousand plus deaths were reported [9].

Despite those years have passed and the pandemic in the waning phase, multiple persistent symptoms were reported post-recovery of acute infection.

Indeed, various authors have used different names such as "post-COVID-19 syndrome", "long COVID-19", "long-term COVID-19 effects", "long haulers" and "persistent COVID-19 symptoms" [10], which refer to various conditions such as lasting inflammation, sequelae of organ damage, hospitalization and social isolation. [11] However, the WHO has established a clinical case definition of the post-COVID-19 syndrome: "it occurs in individuals with a history of probable or confirmed SARS-CoV-2 infection, usually 3 months from the onset of COVID-19 with symptoms and that last for at least 2 months and cannot be explained by an alternative diagnosis" [12].

The original cause of the persistence of symptoms is not well defined, but several hypotheses have been produced [13]: aberrant immune responses, virus-specific pathophysiological alterations, inflammatory damage in response to the acute infection [14], and mechanisms of viral persistence in certain tissues [15] [16], SARS-CoV-2 interactions with host microbiome/virome communities, clotting or coagulation issues [17].

Furthermore, underlying risk factors can be involved: severity of early COVID-19, including symptom load, level of hospital care and the necessity for mechanical ventilation [18], female gender [18], age [19] [20] [21] [22], presence of comorbidity [21] [22] [23] [24] [25] and minority ethnicity [25] [26] foster the development of long COVID.

Moreover, COVID-19 vaccines decrease the risk of contracting infection;

however, studies disagree on their protective effect against long COVID [27].

The respiratory system is known to be the most frequently affected by the COVID-19 acute illness phase, which is prolonged in the post-COVID-19 phase after patients' recovery [10]. However, it is now well recognized that extrapulmonary systems such as the cardiovascular (CV) and nervous systems are also affected [10], producing symptoms such as cough, shortness of breath, fatigue, headache, chest pains, gastrointestinal issues, joint pains and loss of taste and smell, along with neuropsychiatric symptoms, for instance, insomnia, delirium, depression, and anxiety [28]-[36].

As all that has been said, these long-term effects of COVID-19 will have a great impact on the future of the country's public health by causing permanent disabilities and maximizing the burden of chronic diseases [37]. Hence, the aim of this paper is to fulfill the knowledge gap in the literature by providing information regarding the persistence of symptoms in COVID-19 recovered patients in Qassim Region, Saudi Arabia, as we didn't find a similar study had been conducted in Qassim Region. Additionally, it provided an in-depth study regarding the identification of persistency of symptoms or multi-organ dysfunction in recovered confirmed cases.

2. Materials and Methods

2.1. Study Design, Setting, and Population

This cross-sectional study was carried out between 1st January 2021 to 31st March 2022 in Qassim Region, Saudi Arabia, which is located in the central part of Saudi Arabia with an estimated population of 1.5 million in 2020 [38]. There are 19 Governmental hospitals and 165 PHCCs providing health care services under different specialties in the region. The target population was patients who were diagnosed with positive PCR of COVID-19 in the Qassim region.

2.2. Sample Size

The sample size was calculated using the Epi Info Stat calculator. According to the Saudi CDC, the total number of reported positive cases of COVID-19 in the Qassim region was 14,129 cases (2d February 2021). We assumed the prevalence rate of COVID-19, 50% for the calculation of the sample size in this study. At 95% confidence level, 5% margin of error, and a design effect of 2.0. So, the required sample size was 375 participants. Assuming the non-response rate of participants was 10% (38 cases), in addition to 375, it gave a total of 413 participants needed to be invited to achieve the required sample.

2.3. Sampling Procedure

Convenience sampling was applied for the selection of positive PCR Covid-19 cases. The enrolled participants were obtained from the official governmental registered system (HESN surveillance program of COVID-19. Inclusion criteria were adult confirmed COVID-19 patients with +ve PCR results registered in the

surveillance system. After explaining the purpose of the study and getting approval from the administration, participants were contacted and invited to participate in this study. A total of 413 respondents filled the questionnaire through a telephone survey.

2.4. Data Collection Procedure and Instrument

A structured questionnaire [COVID-19 Yorkshire Rehabilitation Scale (C19-YRS)] was used for collecting the data [39]. Patients over 18 years old who were diagnosed as positive COVID-19 (WHO criteria) in Tetamman clinics and registered in the records, were interviewed by telephone survey. The questionnaire contained 35 items divided into three sections. Questions in the first section collected information about patients' age, gender, nationality, education, family size, history of comorbidity, smoking status, and regular exercise. The second section collected the clinical characteristics of the patients, including symptoms at the beginning of the disease and after 2 weeks, medication vaccination status, and duration of isolation. The third part assessed the patient's clinical status by using the C19-YRS checklist [40]. The checklist was administered by telephone and guided the interview. It aimed to underline the persistent symptoms and their intensities concerning the pre-infection condition in a bio-psycho-social way. Moreover, it highlighted three different classes of Post Covid Syndrome (PCS) severity for each symptom (<3 = mild; 3 - 5 = moderate; 6 - 10 = severe). [40] The clinical assessment through the C19-YRS application covered all the domains according to the International Classification of Functioning (ICF), thus investigating symptoms related to body functions and structures, limitations to activities, and participation restrictions considering personal and environmental factors. We selected 10 of the 22 items, the ones directly or indirectly measurable through validation. In the tests and questionnaires, thus we were concerned with: breathlessness at rest, during dressing and stairs, fatigue, pain/discomfort anxiety, depression, communication, mobility, personal care, usual activities, and global health.

2.5. Data Analysis

The collected data were entered and analyzed in SPSS (version 21) Chicago, IL, USA. Descriptive statistics (mean, standard deviation, and frequency) were calculated for all clinical parameters and C19-YRS items for ICU-hospitalized, Ward-hospitalized patients, and Home isolated patients. The Chi-Square test was used for between-groups differences. C19-YRS outcomes have been examined considering frequency and intensity in the answers given. The scale's internal consistency has been checked by Cronbach's alpha coefficient, a magnitude index for the between-items coherence, where values of >0.70 represent high consistency. The level of significance will be $p < 0.01$.

2.6. Ethical Considerations

The ethical approval was taken from the Regional Research Ethics Committee,

Qassim region (Approval #: 1442-1459584). A permission letter was obtained from the regional director of the Qassim MOH before starting the data collection. Verbal Informed consent was obtained from each participant before commencing the data collection. The researcher preserved the participants' confidentiality at all steps of the study for the data collection, analysis, and results.

3. Results

3.1. Sample Characteristics

A total of 413 confirmed COVID-19 patients were enrolled in this study; their data was obtained from the HESN surveillance program of COVID-19, Qassim Health Cluster. The personal characteristics of COVID-19 Patients are given in Table 1.

Table 1. Socio-demographic characteristics of the study population, Qassim, KSA 2021.

Characteristics	Frequency (%)
Sex	
Male	219 (53.0%)
Female	194 (47.0%)
Age group (years)	
≤25	86 (20.8%)
26 - 35	126 (30.5%)
36 - 45	82 (19.9%)
46 - 55	56 (13.6%)
56 - 60	18 (4.4%)
>60	45 (10.9%)
Education	
Illiterate	22 (5.3%)
Primary school	17 (4.1%)
Secondary school	35 (8.5%)
High school	69 (16.7%)
Collage	245 (59.3%)
Post-graduation	25 (6.1%)
Family size	
3 - 4 members	133 (32.2%)
5 - 6 members	144 (34.9%)
≥7 members	136 (32.9%)
Residence	
Buraydah	153 (37.0%)
Unizah	95 (23.0%

Continued

Alrass	68 (16.5%)
Albukauryaha	38 (9.2%)
Albadayha	23 (5.6%)
Riyadh alkhabra	26 (6.3%)
Alnabhaniah	5 (1.2%)
Gebah	2 (0.5%)
Alasyiah	2 (0.5%)
Almudnaib	2 (0.5%)
Algwarah	2 (0.5%)
Current smoker	
None	330 (79.9%)
Active	44 (10.7%)
Former	32 (7.7%)
Physical exercise	
Yes	116 (28.1%)
No	297 (71.9%)

Male patients were 219 (53.0%) while females were 194 (47.0%). Their average age was 38.7 (±14.97) years. All of them were of Saudi nationality. More than half of the patients had college and postgraduation education 270 (65.4%). The reported patients were from different geographical areas in the Qassim region but the bulk of cases was from Buraydah city153 (37.0%). More than two-thirds of the patients were non-smokers 330 (79.9%) and didn't practice regular physical exercise 297 (71.9%), Table 1.

3.2. Patients' Clinical Profile

One hundred and sixty-six (40%) COVID-19 patients had a history of chronic diseases. Among them, Diabetes 64 (15.5%) and hypertension 60 (14.5%) were the dominant co-morbidity. Table 2 Majority of the covid-19 patients 371 (89.8%), were isolated at home, and of them, 37 (9.0%) were admitted to the hospital, and only 5 (1.2%) cases were treated in the Intensive Care Unit (ICU). Most of the surveyed patients 382 (92.5%) had been covered with the 1st dose of the COVID-19 vaccine at the moment of the data collection; while a few of them 60 (14.5%) had taken the Flu vaccine. The average duration of patients' isolation was 14.8 (±5.53) days. The patients' treatment is mentioned in Table 2.

Table 3 shows the patients' symptoms at the beginning of the COVID-19 infection, fever was the most common complaint 332 (80.4%), with 267 (64.6%) of patients reporting fatigue of varying severity, followed by loss of smell 230 (55.7%). Near half of the patients felt body ache and muscle pain 202 (48.9%), followed by loss of taste 197 (47.7%). Among the respiratory symptom, Cough

Table 2. History of Chronic diseases and vaccination status of COVID-19 patients, Qassim, KSA 2021, (n = 413).

Characteristics	Frequency (%)
Chronic illness	
Yes	166 (40.2%)
No	247 (59.8%)
Types of chronic diseases	
Diabetes Mellitus	64 (15.5%)
Hypertension	60 (14.5%)
Thyroid diseases	52 (12.6%)
Asthma	46 (11.1%)
Renal diseases	8 (1.9%)
Low immunity	3 (0.7%)
cancer	2 (0.5%)
Others	
Cardiac problems	5 (1.1%)
Arthritis	2 (0.4%)
Epilepsy & Facial palsy	2 (0.4%)
Flu vaccine	
Yes	60 (14.5%)
No	352 (85.2%)
COVID-19 vaccine	
Yes	382 (92.5%)
No	28 (6.8%)
Types of COVID-19 vaccine	
Strazinka	93 (22.5%)
Pfizer	236 (57.1%)
Mixed	34 (8.2%)
Jonson & Jonson	2 (0.5%)
Unknown	25 (6.1%)
Other	7 (1.7%)
Admitted to hospital	
In-home isolation	371 (89.8%)
Ward patient	37 (9.0%)
ICU	5 (1.2%)
Isolation days per week	
<1 week	5 (1.2%)
1 - 2 weeks	282 (69.3%)
3 - 4 weeks	102 (25.1%)
<4 weeks	18 (4.4%)

Continued

Symptoms continue after 2 weeks	
Yes	174 (42.1%)
No	239 (57.9%)
Duration of COVID-19 Symptoms per week	
<1 week	199 (48.9%)
1 - 2 weeks	163 (40.0%)
3 - 4 weeks	29 (7.1%)
<4 weeks	16 (4.0%)
Swab after recovery	
Yes	85 (20.6%)
No	328 (79.4%)
Is the disease worsening the quality of life?	
Yes	43 (10.4%)
No	370 (89.6%)
Patients' Medications	
Analgesics, zinc, and vitamin c	136 (32.9%)
Analgesics, Herbal medication, and vitamin c	108 (26.2%)
Respiratory supportive therapy (oxygen, Ventolin), Azithromycin, analgesics, zinc, vitamin c	54 (13.1%)
vitamin c, zinc	49 (11.9%)
Analgesics, azithromycin	29 (7.0%)
Respiratory supportive therapy (oxygen, Ventolin), Azithromycin, analgesics, anticoagulant, and zinc	15 (3.6%)

Table 3. Comparison between patients' symptoms before and after 15 days from the beginning of COVID-19 disease, (n = 413).

Patients' symptoms	At the beginning of the COVID-19 infection	After 15 days from COVID-19 infection
	N (%)	N (%)
Respiratory/ Cardiac symptoms		
Cough	158 (38.3%)	59 (14.3%)
SOB	129 (31.2%)	20 (4.8%)
Congestion or running nose	97 (23.5%)	4 (1.0%)
Sore throat	88 (21.3%)	2 (0.5%)
Chest pain/pressure	75 (18.2%)	8 (1.9%)
Neurological symptoms		
Headache	237 (57.4%)	24 (5.8%)
Loss of smell	230 (55.7%)	89 (21.5%)

Continued

Loss of taste	197 (47.7%)	58 (14.0%)
Confusion	13 (3.1%)	0
Loss of speech or movement	6 (1.5%)	0
Systematic symptoms		
Fever	332 (80.4%)	12 (2.9%)
Tiredness	267 (64.6%)	69 (16.7%)
Aches/Pains	202 (48.9%)	20 (4.8%)
Skin rash	13 (3.1%)	0
GIT symptoms		
Nausea	132 (32.0%)	12 (2.9%)
Diarrhoea	70 (16.9%)	0
Vomiting	55 (13.3%)	1 (0.2%)
Psychological symptoms		
Anxiety	23 (5.6%)	10 (2.4%)
Depression	14 (3.4%)	7 (1.7%)
Other symptoms		
Dizziness	3 (0.7%)	0
Sweating	2 (0.5%)	1 (0.2%)
Bad dreams	1 (0.2%)	1 (0.2%)
Decrease sight	1 (0.2%)	1 (0.2%)
Indigestion	1 (0.2%)	1 (0.2%)
Hair falling	1 (0.2%)	0
Coldness	1 (0.2%)	0
Hallucination	1 (0.2%)	0
Thirst	1 (0.2%)	0

158 (38.3%) was the commonest followed by shortness of breathing (SOB) 129 (31.2%), congestion or running nose 97 (23.5%), sore throat 88 (21.3%), and chest pain or pressure 75 (18.2%). Approximately one-third of patients also experienced nausea (32.0%) and other Gastrointestinal symptoms such as diarrhea 70 (16.9%) and vomiting 55 (13.3%). A few patients had psychological problems such as anxiety 23 (5.6%) and depression 14 (3.4%). Other symptoms also reported such as dizziness, sweating, skin rash, Hair falling, Bad dreams, and Hallucinations were troublesome for very few of the respondents, Table 3.

We compared the patients' symptoms at the beginning of covid-19 and after 15 days from the onset. We found the majority of the patients' symptoms decreased or subsided. But still, some patients suffered from persistent symptoms. Among the highest percentage of the patient's symptoms at the beginning, it's found loss of smell 89 (21.5%) was the commonest continued symptom followed

by tiredness 69 (16.7%), cough 59 (14.3%), and loss of taste 58 (14.0%). Moreover, the average duration of patients' COVID-19 Symptoms was 8.0 (±7.2) days. In less than half of the patients 174 (42.1%) the disease symptoms continued for more than 14 days, Table 3.

3.3. Assessment of Clinical Symptoms by C19-YRS Checklist

In this study, the severity and persistence of COVID-19 symptoms were assessed by the C19-YRS checklist, in Figure 1.

The Patients' symptoms scores and sub-scales are presented in mild, moderate, and severe categories. Among the Body Functions and Structures items, we found the severity of the breathlessness on walking was the prominent symptom compared to other examined symptoms. Followed by breathlessness symptoms during patients' rest and dressing. The severity of depression and anxiety were also highly reported during the disease, followed by fatigue and loss of appetite. Among the activity items, Mobility intensity and unusual activities were similar in the degree of severity, but the personal care intensity was the least, Figure 1.

Patients who were admitted to an intensive care unit (n = 5) were significantly elderly patients ($P < 0.001$), with chronic diseases ($P < 0.01$) mainly Diabetes Mellitus ($P < 0.01$) and Hypertension ($P < 0.01$). However, Gender, education, family size, smoking status, and physical exercise had no significant effects on the patient's type of admission or isolation, Table 4.

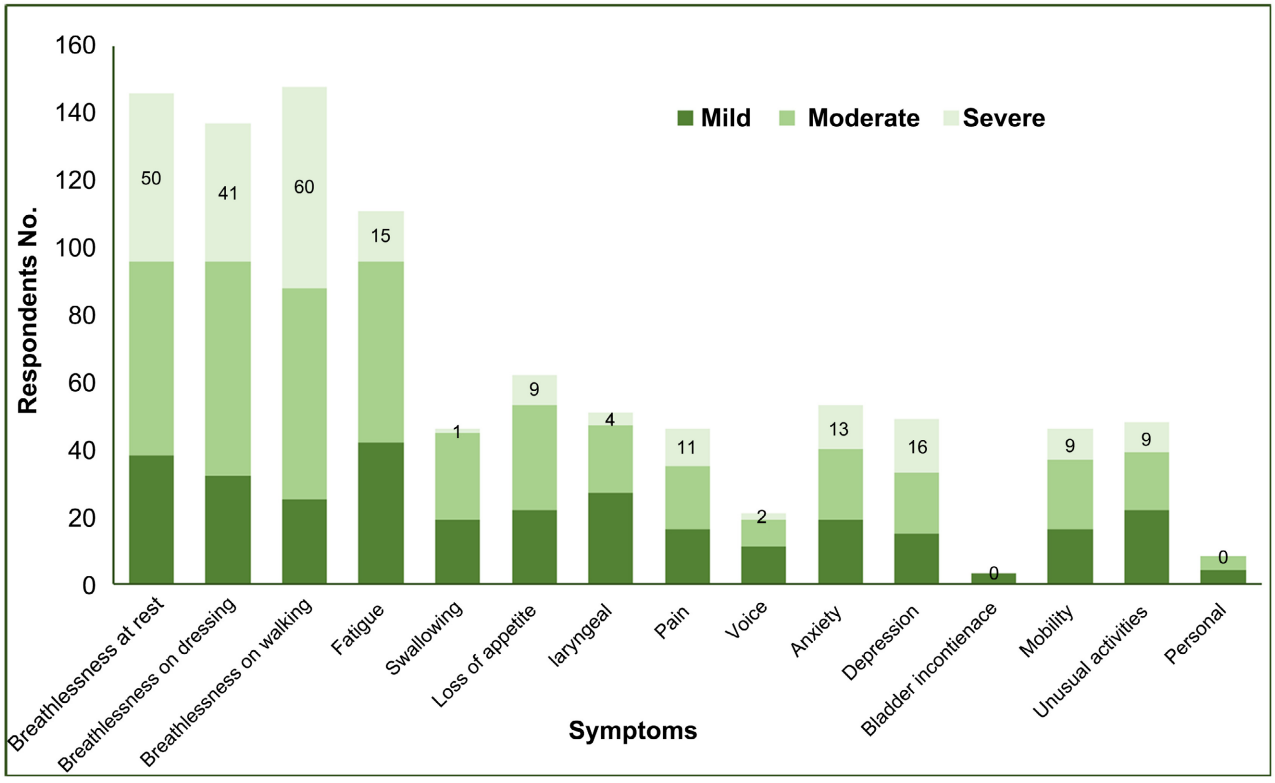

Figure 1. Patients' COVID-19 symptoms severity phenotypes (mild, moderate, severe) based on C19-YRS items score.

Table 4. Correlation between COVID-19 patients' characteristics and admission to ordinary wards and intensive care units or in-home isolation, Qassim, KSA, (n = 413).

Characteristics	Ward patient	ICU patient	Home isolated patient	Total	P-Value
	(n = 37)	(n = 5)	(n = 371)	(n = 413)	
Age group (years)					
≤25	4 (11%)	0	82 (22%)	86 (21%)	**0.000**
26 - 35	5 (14%)	0	121 (33%)	126 (30.5%)	
36 - 45	6 (16%)	1 (20%)	75 (20%)	82 (20%)	
46 - 55	6 (16%)	1 (20%)	49 (13%)	56 (14%)	
56 - 60	9 (24%)	0 (%)	9 (2%)	18 (4%)	
>60	7 (19%)	3 (60%)	35 (9%)	45 (11%)	
Sex					
Male	13 (35%)	3 (60%)	203 (55%)	219 (53%)	0.071
Female	24 (65%)	2 (40%)	168 (45%)	194 (47%)	
Education	5 (14%)	0	17 (5%)	22 (5%)	
Illiterate	3 (8%)	0	14 (4%)	17 (4%)	0.057
Primary school	7 (19%)	1 (20%)	27 (7%)	35 (8%)	
Secondary school	6 (%16)	1 (20%)	62 (17%)	69 (17%)	
High school	16 (43%)	3 (60%)	226 (61%)	245 (59%)	
Collage	0 (%)	0	25 (7%)	25 (6%)	
Post-graduation	5 (14%)	0	17 (5%)	22 (5%)	
Family size					
3 - 4 members	10 (27%)	1 (20%)	122 (33%)	133 (32%)	0.153
5 - 6 members	12 (32%)	0 (%)	132 (36%)	144 (35%)	
≥7 members	15 (41%)	4 (80%)	117 (32%)	136 (33%)	
Current smoker					
None	29 (78%)	5 (100%)	296 (80%)	330 (80%)	0.893
Active	5 (14%)	0	39 (11%)	44 (11%)	
Former	3 (8%)	0	29 (8%)	32 (8%)	
Physical exercise					
Yes	31 (84%)	4 (80%)	262 (71%)	297 (72%)	0.218
No	6 (16%)	1 (20%)	109 (29%)	116 (28%)	
Chronic disease					
Yes	25 (68%)	4 (80%)	137 (37%)	166 (40%)	**0.002**
No	12 (32%)	1 (20%)	229 (62%)	242 (59%)	
Diabetes Mellitus					
Yes	17 (46%)	4 (80%)	43 (12%)	64 (15%)	**0.000**
No	20 (54%)	1 (20%)	328 (88%)	349 (84.5%)	

Continued

Hypertension					
Yes	15 (41%)	2 (40%)	43 (12%)	60 (15%)	**0.000**
No	22 (59%)	3 (60%)	328 (88%)	353 (85%)	

Abbreviations: ICU = Intensive Care Unit; DM = Diabetes Melilites HTN = Hypertension.

Furthermore, the researchers assessed the intensity and severity of the patient's symptoms after 4 weeks concerning the types of admission shown in Table 5; 100% breathlessness was reported in patients admitted to the ICU, 89.1% in patients admitted in the word, and 25% in home isolated patients. ($P < 0.01$). About 60%, pain or discomfort, 40.5% Fatigue, and 32.4% loss of appetite (Body Functions and Structures). Breathlessness was more present during highly demanding tasks, such as climbing stairs, with a C19-YRS reported intensity of 7.6 (2.5) for those who had a history of admission to ICU. Similarly, the laryngeal complication was rated with an intensity of 7.6 (2.5). Finally, anxiety and depression were scored with 0.6 (1.8) and 0.6 (1.7) intensity. Among Activities, reduced mobility was the most significant limitation highlighted (35.1%) after 12 weeks, with a significant influence on usual activities (27%) and personal care (8.1%) (history of word admission), Table 5.

3.4. Persistent Symptoms over Times

Among the Body Functions and Structures items, the correlations were high between breathlessness, fatigue, pain or discomfort, loss of appetite, voice changes symptoms, and hospital admission ($p < 0.01$). At the same time, 2 items from activities had a significant statistical correlation between mobility, unusual activities, and history of hospital admission. The Global Health perception was also highly significant ($p < 0.01$), Table 6.

Further correlations were reported in Table 6. Symptoms after 4 weeks, except for anxiety and bladder continence, all the Body Functions and Structures items, symptoms were still present but significantly reduced except for laryngeal complication and swallowing changes which were slightly increased after 2 weeks ($P < 0.01$). Physical symptoms such as breathlessness improved by 19.1%, and depression by 6.7%, whereas the variation in intensity such as fatigue means and SD 0.9 (1.4) was less pronounced. Conversely, pain (+6.8%) and loss of appetite (+4%) were more represented evidencing persistence over time. Among activities, a significant improvement in usual activities (11.5%) and personal care (2%), were found, whereas mobility became worse (+7.8%). The variation of intensities and the distribution-based measures of responsiveness were reported in Table 6.

4. Discussion

This is the first study in the Qassim Region that applied the C19-YRS in positive

Table 5. COVID-19 Patients' symptoms and their relationship to the types of admission and isolation.

C19-YRS Items	Ward patient (n = 37)	ICU patient (n = 5)	Home isolated patient (n = 371)	Total (n = 413)	P-value
Body Function and Structure					
Breathlessness (%)	89.1%	100%	25.5%	31.2%	
At rest (M, SD)	5.7 (3.2)	7.6 (2.5)	1.3 (2.4)	1.8 (2.9)	**0.000**
Dressing (M, SD)	5.7 (2.9)	7.6 (2.5)	1.2 (2.3)	1.6 (2.8)	**0.000**
Stairs (M, SD)	6.4 (2.9)	7.6 (2.5)	1.4 (2.6)	2.0 (3.1)	**0.000**
laryngeal complication (%)	21.6%	20%	11.9%	12.8%	0.050
(M, SD)	5.7 (3.2)	7.6 (2.5)	1.3 (2.4)	1.8 (2.9)	
voice changes (%)	13.5%	0%	4.3%	5.1%	**0.000**
(M, SD)	0.6 (1.8)	0.0 (0)	0.1 (0.6)	0.6 (0.8)	
Swallowing changes (%)	18.9%	40%	10%	11.1	0.044
(M, SD)	0.5 (1.2)	1.4 (1.9)	0.3 (1.0)	0.4 (1.1)	
Loss of appetite (%)	32.4%	20%	12.9%	14.8	**0.000**
(M, SD)	1.6 (2.6)	0.6 (1.3)	0.5 (1.5)	0.6 (1.6)	
Fatigue (%)	40.5%	20%	25.6%	25.9%	**0.000**
(M, SD)	2.1 (2.9)	0.6 (1.3)	0.8 (1.7)	0.9 (1.8)	
Pain/discomfort (%)	16.2%	60%	11.1%	12.1%	**0.000**
(M, SD)	0.9 (2.2)	3.4 (3.1)	0.4 (1.4)	0.5 (1.5)	
Anxiety (%)	10.8%	0%	12.9%	12.5%	0.485
(M, SD)	0.3 (0.9)	0.0 (0)	0.6 (1.8)	0.6 (1.7)	
Depression (%)	10.8%	20%	12.7%	12.6%	0.957
(M, SD)	0.5 (1.5)	0.6 (1.3)	0.6 (1.8)	0.6 (1.8)	
Bladder continence (%)	0%	0%	0.8%	0.7%	0.841
(M, SD)	0.0 (0)	0.0 (0)	0.01 (0.1)	0.007 (0.09)	
Activities					
Mobility (%)	35.1%	20%	8.6%	11.1%	**0.000**
(M, SD)	1.6 (2.6)	0.4 (0.9)	0.3 (1.2)	0.4 (1.4)	
Personal care (%)	8.1%	0%	1.3%	1.9%	0.395
(M, SD)	0.1 (0.5)	0.0 (0)	0.04 (0.4)	0.1 (0.4)	
Usual activities (%)	27%	20%	9.2%	10.9%	**0.000**
(M, SD)	1.3 (2.2)	0.4 (0.9)	0.3 (1.1)	0.4 (1.3)	
Personal factor					
Global Health (%)	97.3%	100%	100%	99.8%	**0.000**
(M, SD)	7.1 (2.5)	8.8 (1.6)	8.8 (1.6)	8.6 (1.7)	

Abbreviations: ICU = Intensive Care Unit.

Table 6. Responsiveness of COVID-19 symptoms before and after 4 weeks.

C19-YRS Items	Total (n = 413)		P-value
	Symptoms in the acute phase (Less than 28 days)	Persistence symptoms (More than 28 days)	
Body Function and Structure			
Breathlessness (%)	31.6%	12.5%	
At rest (M, SD)	1.8 (2.9)	0.1 (0.3)	0.77
Dressing (M, SD)	1.6 (2.8)	0.3 (0.8)	0.20
Stairs (M, SD)	2.0 (3.1)	0.4 (1.0)	0.20
laryngeal complication (%)	11.5%	50%	
(M, SD)	0.3 (1.1)	1.2 (1.5)	**0.01**
voice changes (%)	5.4%	0	
(M, SD)	0.2 (0.8)	0.0 (0)	0.63
Swallowing changes (%)	10%	43.8%	
(M, SD)	0.3 (1.0)	1.5 (1.9)	**0.00**
Loss of appetite (%)	14.8%	18.8%	
(M, SD)	0.6 (1.6)	1.1 (2.7)	0.27
Fatigue (%)	27.1%	31.3%	
(M, SD)	0.9 (1.9)	0.9 (1.4)	0.46
Pain/discomfort (%)	12%	18.8%	
(M, SD)	0.5 (1.5)	0.7 (1.7)	0.65
Anxiety (%)	13.3%	0	
(M, SD)	0.6 (1.8)	0.0 (0.0)	0.31
Depression (%)	13%	6.3%	
(M, SD)	0.6 (1.9)	0.1 (0.5)	0.45
Bladder continence (%)	0.8%	0	
(M, SD)	0.01 (0.1)	0.0 (0.0)	0.91
Activities			
Mobility (%)	11%	18.8%	
(M, SD)	0.5 (1.5)	0.4 (0.8)	0.72
Personal care (%)	2%	0	
(M, SD)	0.1 (0.4)	0.0 (0.0)	0.83
Usual activities (%)	11.5%	0	
(M, SD)	0.4 (1.3)	0.0 (0.0)	0.34
Personal factor			
Global Health (%)	391	16	
(M, SD)	8.6 (1.8)	8.6 (1.3)	0.35

Abbreviations: M = Mean, SD = Standard Deviation.

PCR COVID-19 patients to report the responsiveness of the scale in Post COVID-19 Syndrome (PCS).

This study demonstrated that this scale could be a valuable tool in detecting the multidimensional nature of Post-COVID Syndrome, characterized by physical, cognitive, and psychological symptoms that persist longer than 4weeks from the acute infection [36] [41]. Our sample reported persistent symptoms related to Body Functions and Structures, such as laryngeal complications (50%), Swallowing changes (43.8%), fatigue (31.3%), pain (18.8%), loss of appetite (18.8%), breathlessness (12.5%), and depression (6.3%), and Activities such as reduced mobility (18.8%) after 4 weeks. These findings are consistent with previous studies that reported the persistence of symptoms in post-COVID patients [32] [35] [42] [43].

Furthermore, our findings supported that COVID-19 severity or intensive care hospitalization directly influenced the persistence of symptoms after 4 weeks [32] [40]. Differences in symptoms severity have been found among patients admitted to the ICU, Ward, or in-home isolation in our cohort. This can be explained by factors, such as age, and co-morbidities with chronic diseases, which may influence COVID severity on PCS ($P < 0.01$). Our ICU patients were significantly older than ward patients and with diabetes Mellitus, and hypertension ($P < 0.01$). This established a positive relation to PCS [44] [45].

After 4 weeks, the more common PCS physical symptoms, such as breathlessness and fatigue, were significantly less represented, but laryngeal complications and Swallowing changes were significantly represented. Similarly, the severity of phenotypes was changed, with a small portion of patients with persistent severe symptoms. The symptoms' entity may be related to several factors such as the extent of organ damage, duration of hospital admission, the difference in recovery time, and complications related to co-morbidities [46].

Psychological distress was less pronounced in the study group; only depression was still present after 4 weeks with less severity. These findings in recovery profiles for physical and psychological functions might reflect the need for long-term management for both psychological and physical well-being in COVID-19 patients. We highlighted a significant improvement in personal care and usual activities regarding Activities. However, change in mobility was still a severe phenotype after 4 weeks.

Limitations of the Study

This study has several limitations. Firstly, this was an observational study where patients were assessed through a telephone survey; recall memories can be considered a bias for detecting responsiveness. Secondly, we included only COVID-19 patients who registered in the Qassim Surveillance system. Thirdly, symptoms and their severity were self-reported by COVID-19 patients, leading to a possible degree of subjectivity in their reporting. For these reasons, the results cannot be generalized to all Saudi post-COVID populations.

Despite these limitations, we are confident that the C19-YRS will turn out to be a useful addition to current assessments of post-COVID-19 in clinical studies and could be used to complement clinician-rated measures of symptoms.

5. Conclusion

The C19-YRS was a valuable patient-reported outcome for screening, assessing severity, and monitoring the persistence of symptoms after 4 weeks from the onset of COVID-19 in a cohort of Saudi patients. The study examined the post covid syndrome and its severity by patients' responsiveness to the scale items in C19-YRS. The Body Functions and Structures such as laryngeal complications, swallowing changes, fatigue, pain, breathlessness, and depression were persistent after 4 weeks also change in mobility was reported in the activities. Follow-up of the physical and psychological condition of hospitalized and non-hospitalized patients is highly needed. Finally, this study highlighted the importance of rehabilitation and long-term management of the persistent symptoms in post-COVID patients.

Availability of Data and Material

Data generated during this study are available from the corresponding author on request.

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Authors' Contributions

All authors contributed to Conceptualization and Methodology, carried out the formal analysis, arranged resources, collected data, supervised the project, was involved in project administration, wrote the initial draft, and critically reviewed and edited the manuscript. All authors approved the final draft for publication.

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Conflicts of Interest

The authors have no competing interests to declare relevant to this article's content.

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