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ORIGINAL ARTICLE

Assessment of Physical and Functional Health Problems among Post-COVID-19 Patients Attending Public Health Institutions in Qaladiza City, Kurdistan Region of Iraq: A Cross-Sectional Study

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ABSTRACT

Post-COVID-19 patients in Qaladiza City, Kurdistan Region, Iraq, continue to face a number of chronic health issues that impact their functional and physical well-being. In addition to examining the sociodemographic and clinical predictors of these health outcomes, the study sought to determine the prevalence and severity of physical and functional health issues among individuals who had recovered from COVID-19. Convenience sampling was used in this cross-sectional study, which was carried out at two public health facilities in Qaladiza City between March 1st and July 1st, 2025. The study employed a standardized questionnaire that asked about demographics, functional health issues, and physical health issues. Stata version 12 (StataCorp LLC, College Station, TX) was used for statistical analysis. Relationships between physical and functional scores were evaluated using Spearman's rho correlation, associations between sociodemographic/clinical factors and health categories were examined using chi-square tests, and predictors of physical and functional health problems were identified using ordinal logistic regression. The study included 150 post-COVID-19 patients, whose mean age was 41.01 ± 13.05 years. The majority (72.0%) were categorized as moderate, with a mean score of 29.31 ± 3.73 for physical problems. The majority (63.3%) were classified as moderate, and the mean functional problem score was 14.71 ± 2.24. Physical and functional scores showed a significant positive connection ($r = 0.20$, $p = .012$). According to ordinal regression analysis, a history of chronic disease was strongly linked to worse functional outcomes ($p = .002$), whereas a lower level of education was significantly linked to worse physical health outcomes ($p = .014$). The study showed that weariness, joint discomfort, and everyday work challenges are the most common physical and functional health issues experienced by post-COVID-19 patients in Qaladiza. Health outcomes were found to be significantly predicted by education and a history of chronic illness. For post-COVID-19 patients, targeted interventions that target vulnerable populations are advised to enhance rehabilitation and quality of life.

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1- INTRODUCTION

The long term consequences of coronavirus disease 2019 (COVID-19), commonly referred to as post-COVID-19 condition or long COVID, are significant global public health concern [1]. Although considerable progress has been made in the knowledge base regarding the acute phase of the infection caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), an increasing body of evidence points to the fact that people may be experiencing some limitations after the initial recovery period. These prolonged symptoms may have negative impact on physical capacity, daily functioning, and overall quality of life [2]. The prevalence of post-COVID-19 sequelae is increasingly recognized across different populations; however, its impact appears to be too much higher in resource-limited areas. Limited access to healthcare services, rehabilitation programs, and social support may increase vulnerability to persistent disability following COVID-19 infection [3]. Long-term COVID is still underreported and poorly described in many low- and middle-income areas, including parts of the Middle East, despite widespread attention to the illness [4].

Clinically, post-COVID-19 syndrome can present with different physical symptoms that affect multiple organ systems. Frequently reported manifestations include fatigue, dyspnea, palpitations, myalgia, sleep disturbances, and cognitive difficulties. Those symptoms may remain for months after the acute illness [5]. The underlying mechanisms may include the continuation of inflammatory processes, immune system disorders, autonomic nervous system disorders, and physical deconditioning. Individuals who have had a history of chronic health conditions and weakened immunity may also be more prone to the persistence and severity of post-COVID-19 symptoms [6]. If more than one body system is involved, then serious health complications such as thromboembolism, respiratory, dysautonomia, and gastrointestinal disorders can occur [7].

Beyond physical symptoms, post-COVID-19 condition may substantially impair functional health status. Many recovered patients said that they can't perform daily activities properly. Also they reported decreased performance at work, and have constraints in social participation. It is becoming more widely acknowledged that functional impairment after COVID-19 is a significant determinant of health-related quality of life and a major part of the long-term disease burden [8, 9]. Thus, in order to plan appropriate rehabilitation services and comprehend the true impact of the post-COVID-19 condition, a thorough assessment of both the physical and functional domains is necessary [10]. Rehabilitation and supportive management strategies have been increasingly advocated as a means of reducing the long-term effects of COVID-19. Educational and rehabilitation programs, which are structured and symptom-based, have been found to have positive progress in the rehabilitation of those affected [9]. Community-based rehabilitation programs and home-based exercise interventions have been suggested as potential and feasible options, especially in resource-poor settings where there are limited facilities. However, there are still disparities in the access to these services, and they are limited in resource-poor settings [11, 12]. Since the start of the pandemic, Iraq has seen a significant burden of COVID-19. According to Worldometer (2024), the country has recorded more than 2.46 million confirmed cases and over 25,000 related deaths, reflecting widespread transmission and 2.44 million survivors who may be at risk of developing post-COVID-19 complications. He increasing number of people who have recovered emphasizes how critical it is to assess the long-term functional and physical effects of COVID-19 [13].

In Iraq and the Kurdistan Region specifically, empirical evidence regarding the physical and functional outcomes of post-COVID-19 patients remains scarce. Most of the published studies have been conducted in high-income countries. In addition, the results may not be fully applicable to the local population because of variations in healthcare infrastructure, socioeconomic status, and access to post-acute care. The need to generate context-specific data is critical to assist in healthcare planning, rehabilitation efforts, and vulnerable populations. Qaladiza City, located in the Kurdistan Region of Iraq, is an area where the services provided after COVID-19 have not been fully established, and the extent of the patient's long-term needs has not been sufficiently documented. It is essential to understand the pattern and predictors of long-term physical and functional health problems of patients accessing public health facilities in this region. Therefore, the main objective of this study was to determine the prevalence and severity of physical and functional health problems among post COVID-19 patients who visit public health facilities in Qaladiza City in the Kurdistan Region of Iraq.

2- MATERIALS AND METHODS

Study Design, Setting, Period, and Sampling

This study was a descriptive cross-sectional study conducted in two public health institutions in Qaladiza City, Kurdistan Region of Iraq. Data were collected from March 1st to July 1st, 2025 during outpatient follow-up visits, using convenience sampling method.

Sample Size

The sample size for this study was determined using the infinite population sample size formula, assuming a confidence level of 95%, a margin of error of 7.85%, and a population proportion of 60%. Based on this calculation, a minimum of 150 participants was required.

Inclusion/exclusion

The inclusion criteria for participants were: patients of both genders, aged 18 years or older, who had previously been diagnosed with and recovered from COVID-19, attended the selected health institutions during the study period, and gave verbal consent to participate. Exclusion criteria included patients with severe psychiatric or cognitive impairments, individuals with comorbid conditions that could confound COVID-19-related symptoms (e.g., active cancer or autoimmune disorders), and patients who refused participation or were unable to complete the questionnaire.

Study Tools and Data Collection

The study questionnaire was a structured, self-administered tool consisting of four main parts. The first part collected socio-demographic data including age, gender, marital status, education, occupation, residency, smoking status, monthly income, and chronic illness history. The second part assessed physical health problems, including 20 common post-COVID-19 symptoms such as fatigue, fever, headaches, shortness of breath, cough, joint pain, muscle pain, back pain, loss of taste or smell, gastrointestinal symptoms, and others. The third part assessed functional and social health problems, including changes in daily activities, social interactions, lifestyle, and recovery-supportive factors such as sleep, diet, and exercise. The questionnaire was originally developed in English and translated into Kurdish using the forward–backward translation method. It was distributed in printed form, and patients were given 15–20 minutes to complete it. Clarifications were provided by the researchers when necessary.

Pilot Study

The questionnaire was initially tested with 25 post-COVID-19 patients attending the same institutions one month prior to the study. The pilot study aimed to assess clarity, acceptability, and internal consistency of items. Cronbach's alpha was calculated for the total scale, yielding a value of 0.83, indicating very good reliability [14]. Data from the pilot were excluded from the final analysis. Content validity was reviewed and confirmed by a panel of 10 experts in public health and community medicine.

Sociodemographic Characteristics

The first section of the questionnaire collected participants' sociodemographic and clinical details, including age, gender, marital status, education, occupation, residency, smoking status, monthly income, and chronic illness history.

Physical and Functional Health Assessment

Physical health problems were assessed using 20 structured items, each answered with Yes = 1 or No = 2. These items covered the most common post-COVID-19 symptoms, including fatigue, fever, headaches, shortness of breath, persistent cough, sputum/phlegm production, sore throat, joint pain, muscle pain, back pain, blood pressure irregularities, heart palpitations, chest tightness, nausea, diarrhea, abdominal pain, loss of appetite, skin rashes, hair loss, and changes in the sense of taste or smell. The total possible score ranged from 20 to 40, with lower scores reflecting greater symptom burden. For interpretation, physical health scores were categorized as Poor (≤24), Moderate (25–31), and High (≥32). Functional health problems were evaluated through 10 structured items, also answered with Yes = 1 or No = 2. These items assessed the impact of COVID-19 recovery on daily work responsibilities, social life, overall lifestyle, use of medication, social media support, physical exercise, dietary changes, rest and adequate sleep, reduced social interaction or isolation, and changes in family relationships. The

total functional score ranged from 10 to 20, with lower scores indicating greater functional impairment. Categories were defined as Poor (≤12), Moderate (13–15), and High (≥16).

Ethical Approval and Informed Consent

This study adhered to the principles of the Declaration of Helsinki. Ethical approval was obtained from the Scientific and Ethics Committee of the College of Nursing, University of Raparin, as well as the General Directorate of Health in Rania. Permissions were secured to access the selected health institutions. All participants provided verbal informed consent after being informed of the study objectives and their right to withdraw at any time. Confidentiality and anonymity were strictly maintained by coding the data without identifying patient names.

Statistical Analysis

While mean and standard deviations were used to portray quantitative factors, frequency and percentage were used to summarize and report data for qualitative variables. Spearman's rho correlation coefficient was used to evaluate the connections between functional and physical health scores. The Chi-square test was used to assess the relationship between health categories and sociodemographic/clinical factors. Ordinal logistic regression analysis was used to find independent predictors of physical and functional health categories while accounting for any confounding variables. Stata version 12 (StataCorp LLC, College Station, TX) was used to analyze the data, and a p-value of less than 0.05 was deemed statistically significant.

3- RESULTS AND DISCUSSION

Demographic characteristics

A total of 150 post-COVID-19 patients were involved in the current study, with a mean age of 41.01 ± 13.05 years. The largest proportion of participants were aged 20–39 years (80; 53.3%), followed by 40–59 years (54; 36.0%), while only 16 (10.7%) were 60 years and above. In terms of gender distribution, 90 participants (60.0%) were male, compared to 60 (40.0%) females. Regarding marital status, the majority were married (113; 75.3%), while only 30 (20.0%) were single. Education levels showed that nearly half of the participants had a university degree or higher (63; 42.0%), whereas 37 (24.7%) had secondary education. More than half of the patients were employed (83; 55.3%), and most resided in urban areas (77; 51.3%). Concerning lifestyle and clinical factors, 108 (72.0%) were non-smokers and 111 (74.0%) reported no chronic illness history. For health categories, the mean physical problem score was 29.31 ± 3.73, with the majority categorized as moderate (108; 72.0%), while the mean functional problem score was 14.71 ± 2.24, with most patients also falling into the moderate level (95; 63.3%). Detailed demographics and other variables are presented in Table 1.

Table (1): Socio-Demographic, Clinical, and Health Categories of Post-COVID-19 Patients (n = 150)

No.	Variables	Characteristics n=150	F	%
1.	**Age group**	20–39	80	53.30
		40–59	54	36.00
		60–79	16	10.70
		Mean ± SD	41.01 ± 13.05	
2.	**Gender**	Male	90	60.00
		Female	60	40.00
3.	**Marital Status**	Single	30	20.00
		Married	113	75.30
		Divorced	2	1.30
		Widowed	5	3.30
4.	**Level of Education**	No formal education	16	10.70
		Primary school	33	22.00
		Secondary school	37	24.70
		University or higher	63	42.00

5.	**Occupation**	Employed	83	55.30
		Unemployed	64	42.70
		Retired	3	2.00
6.	**Residency**	Urban	77	51.30
		Suburban	73	48.70
7.	**Smoking**	Yes	42	28.00
		No	108	72.00
8.	**Monthly Income**	Low	43	28.70
		Moderate	103	68.70
		High	4	2.70
9.	**Chronic Illness History**	Yes	39	26.00
		No	111	74.00
10.	**Physical Category**	Poor	11	7.30
		Moderate	108	72.00
		High	31	20.70
		Mean ± SD	29.31 ± 3.73	
11.	**Functional Category**	Poor	15	10.00
		Moderate	95	63.30
		High	40	26.70
		Mean ± SD	14.71 ± 2.24	

Note: Values are presented as frequency (F) and percentage (%). Continuous variables are expressed as mean ± SD. Abbreviations: SD = Standard Deviation.Scoring details: Physical problems (20 items, Yes=1, No=2; total range 20–40) were categorized as Poor (≤24), Moderate (25–31), and High (≥32). Functional problems (10 items, Yes=1, No=2; total range 10–20) were categorized as Poor (≤12), Moderate (13–15), and High (≥16).

Physical Health Problems

The results revealed that the most common physical health problem experienced by post-COVID-19 patients was fatigue, reported by 118 patients (78.7%), followed by joint pain in 106 (70.7%), headaches in 105 (70.0%), and muscle pain in 100 (66.7%). Other frequently reported problems included back pain (98; 65.3%), loss of smell (95; 63.3%), and sore throat (94; 62.7%). Less frequent but notable complaints were blood pressure irregularities (61; 40.7%), nausea (60; 40.0%), and heart palpitations (62; 41.3%). Relatively fewer patients reported skin rashes (47; 31.3%) and diarrhea (56; 37.3%). The mean scores indicated that fatigue (1.21 ± 0.41), joint pain (1.29 ± 0.46), and headaches (1.30 ± 0.46) were the most prominent physical health issues, whereas higher mean values for skin rashes (1.69 ± 0.47) and diarrhea (1.63 ± 0.49) reflected their lower prevalence. For further details, see Table 2.

Table (2): Distribution and Mean Scores of Physical Health Problems among Post-COVID-19 Patients (n = 150)

No.	Variables	Response	F	%	Mean ± SD
1.	**Fatigue**	Yes	118	78.67	1.21 ± 0.41
		No	32	21.33	
2.	**Fever**	Yes	95	63.33	1.37 ± 0.48
		No	55	36.67	
3.	**Headaches**	Yes	105	70.00	1.30 ± 0.46
		No	45	30.00	
4.	**Shortness of breath**	Yes	91	60.67	1.39 ± 0.49

		No	59	39.33	
5.	**Persistent cough**	Yes	75	50.00	1.50 ± 0.50
		No	75	50.00	
6.	**Sputum/phlegm**	Yes	69	46.00	1.54 ± 0.50
		No	81	54.00	
7.	**Sore throat**	Yes	94	62.67	1.37 ± 0.49
		No	56	37.33	
8.	**Joint pain**	Yes	106	70.67	1.29 ± 0.46
		No	44	29.33	
9.	**Muscle pain**	Yes	100	66.67	1.33 ± 0.47
		No	50	33.33	
10.	**Back pain**	Yes	98	65.33	1.41 ± 0.92
		No	52	34.67	
11.	**Blood pressure irregularities**	Yes	61	40.67	1.59 ± 0.49
		No	89	59.33	
12.	**Heart palpitations**	Yes	62	41.33	1.59 ± 0.49
		No	88	58.67	
13.	**Loss of taste**	Yes	91	60.67	1.52 ± 1.67
		No	59	39.33	
14.	**Loss of smell**	Yes	95	63.33	1.37 ± 0.48
		No	55	36.67	
15.	**Diarrhea**	Yes	56	37.33	1.63 ± 0.49
		No	94	62.67	
16.	**Abdominal pain**	Yes	58	38.67	1.61 ± 0.49
		No	92	61.33	
17.	**Loss of appetite**	Yes	84	56.00	1.44 ± 0.50
		No	66	44.00	
18.	**Skin rashes**	Yes	47	31.33	1.69 ± 0.47
		No	103	68.67	
19.	**Hair loss**	Yes	66	44.00	1.56 ± 0.50
		No	84	56.00	
20.	**Nausea**	Yes	60	40.00	1.60 ± 0.49
		No	90	60.00	

Note: Values are presented as frequency (F), percentage (%), and item-level mean ± standard deviation (SD). Response options were coded as Yes = 1 and No = 2. Lower mean scores indicate higher prevalence of problems.

Functional Health Problems

The results showed that the most frequently reported functional problem among post-COVID-19 patients was a reduced ability to carry out daily work, affecting 102 patients (68.0%), followed by reliance on medication during recovery (104; 69.3%) and the positive contribution of rest and sleep (107; 71.3%). More than half also reported that dietary changes (100; 66.7%) and social media use (84; 56.0%) supported their recovery. In contrast, less than half of the patients noted social isolation (60; 40.0%) or changes in family relationships (56; 37.3%). The lowest mean values indicated that rest and adequate sleep (1.29 ± 0.45), dietary changes (1.33 ± 0.47), and daily work difficulties (1.32 ± 0.47) were the most common functional concerns, while higher means for changes in family relationships (1.63 ± 0.49) and social isolation (1.60 ± 0.49) reflected relatively lower prevalence. For more details, refer to Table 3.

Table (3): Distribution and Mean Scores of Functional Health Problems among Post-COVID-19 Patients (n = 150)

No.	Variables	Response	F	%	Mean ± SD
1.	**Affected ability to carry out daily work**	Yes	102	68.00	1.32 ± 0.47
		No	48	32.00	
2.	**Social life changed**	Yes	51	34.00	1.66 ± 0.48
		No	99	66.00	
3.	**Overall lifestyle impacted**	Yes	77	51.33	1.49 ± 0.50
		No	73	48.67	
4.	**Taking medication helped recovery**	Yes	104	69.33	1.43 ± 1.67
		No	46	30.67	
5.	**Social media assisted recovery**	Yes	84	56.00	1.44 ± 0.50
		No	66	44.00	
6.	**Physical exercise supported recovery**	Yes	72	48.00	1.52 ± 0.50
		No	78	52.00	
7.	**Dietary changes helped recovery**	Yes	100	66.67	1.33 ± 0.47
		No	50	33.33	
8.	**Rest and adequate sleep contributed positively**	Yes	107	71.33	1.29 ± 0.45
		No	43	28.67	
9.	**Reduced social interaction/isolation**	Yes	60	40.00	1.60 ± 0.49
		No	90	60.00	
10.	**Health changes affected family relationships**	Yes	56	37.33	1.63 ± 0.49
		No	94	62.67	

Note: Values are presented as frequency (F), percentage (%), and item-level mean ± standard deviation (SD). Response options were coded as Yes = 1 and No = 2. Lower mean scores indicate higher prevalence of problems.

Associations of Health Categories with Socio-Demographic and Clinical Variables

The findings illustrated that level of education and monthly income were significantly associated with the physical health category ($\chi^2 = 15.81$, $p = .02$; $\chi^2 = 12.33$, $p = .02$, respectively), with higher education and better income linked to more favorable outcomes. For functional health, education also showed a borderline association ($\chi^2 = 12.88$, $p = .05$), while a highly significant relationship was observed with chronic illness history ($\chi^2 = 13.54$, $p < .01$), where patients with no chronic illness were more likely to report better functional status. Other variables, including age group, gender, marital status, and residency, did not demonstrate significant associations with either physical or functional categories as in Table 4.

Table (4): Association of Physical and Functional Health Categories with Socio-Demographic and Clinical Variables (n = 150)

Variable	Category	Poor n (%)	Moderate n (%)	High n (%)	χ^2 (df)	p-value
Physical Category						
Age group	20–39	7 (8.8)	57 (71.3)	16 (20.0)	7.05 (4)	.13
	40–59	2 (3.7)	37 (68.5)	15 (27.8)		
	60–79	2 (12.5)	14 (87.5)	0 (0.0)		
Gender	Male	7 (7.8)	64 (71.1)	19 (21.1)	0.11 (2)	.95
	Female	4 (6.7)	44 (73.3)	12 (20.0)		
Marital status	Single	2 (6.7)	24 (80.0)	4 (13.3)	4.73 (6)	.58
	Married	8 (7.1)	78 (69.0)	27 (23.9)		
	Divorced	0 (0.0)	2 (100.0)	0 (0.0)		
	Widowed	1 (20.0)	4 (80.0)	0 (0.0)		
Education	No formal	3 (18.8)	13 (81.3)	0 (0.0)	15.81 (6)	.02 *
	Primary	3 (9.1)	26 (78.8)	4 (12.1)		
	Secondary	4 (10.8)	27 (73.0)	6 (16.2)		
	University+	1 (1.6)	42 (66.7)	20 (31.7)		
Monthly Income	Low	7 (16.3)	33 (76.7)	3 (7.0)	12.33 (4)	.02 *
	Moderate	4 (3.9)	72 (69.9)	27 (26.2)		
	High	0 (0.0)	3 (75.0)	1 (25.0)		
Chronic illness	Yes	2 (5.1)	32 (82.1)	5 (12.8)	2.66 (2)	.27
	No	9 (8.1)	76 (68.5)	26 (23.4)		
Functional Category						
Age group	20–39	6 (7.5)	53 (66.3)	21 (26.3)	2.12 (4)	.72
	40–59	6 (11.1)	33 (61.1)	15 (27.8)		
	60–79	3 (18.8)	9 (56.3)	4 (25.0)		
Gender	Male	7 (7.8)	55 (61.1)	28 (31.1)	2.95 (2)	.23
	Female	8 (13.3)	40 (66.7)	12 (20.0)		
Education	No formal	4 (25.0)	10 (62.5)	2 (12.5)	12.88 (6)	.05 *
	Primary	0 (0.0)	23 (69.7)	10 (30.3)		
	Secondary	5 (13.5)	26 (70.3)	6 (16.2)		
	University+	6 (9.5)	35 (55.6)	22 (34.9)		
Monthly Income	Low	5 (11.6)	29 (67.4)	9 (20.9)	2.21 (4)	.70
	Moderate	10 (9.7)	64 (62.1)	29 (28.2)		
	High	0 (0.0)	2 (50.0)	2 (50.0)		
Chronic illness	Yes	8 (20.5)	28 (71.8)	3 (7.7)	13.54 (2)	< .01 **
	No	7 (6.3)	67 (60.4)	37 (33.3)		

Note: Values are expressed as n (%). χ^2 = Pearson Chi-Square test; *p < .05 significant, **p < .01 highly significant.

Correlation between Physical and Functional Health Scores

The results showed a significant positive correlation between physical and functional health scores among post-COVID-19 patients (Spearman's rho = 0.20, $p < .05$). This indicates that patients reporting more physical health problems were also more likely to report functional difficulties, although the strength of the relationship was relatively weak. For more details, refer to Table 5.

Table (5): Spearman's Correlation between Physical and Functional Health Scores among Post-COVID-19 Patients (n = 150)

Variables	Physical Score	Functional Score
Physical Score	1.00	0.20*
Functional Score	0.20*	1.00

Note: Values are Spearman's rho correlation coefficients. *$p < .05$ (2-tailed) indicates statistical significance.

Predictors of Physical and Functional Health Categories

The results of ordinal logistic regression revealed that education was a significant predictor of physical health problems, where patients with no formal education were less likely to report favorable physical outcomes compared to those with university-level education (Estimate = –2.00, p = .014). In contrast, other demographic factors such as age, gender, marital status, income, and chronic illness history were not significant predictors of physical health categories. For functional health categories, the findings indicated that chronic illness history was a strong predictor, with patients who had chronic illness being significantly more likely to report poorer functional outcomes compared to those without chronic illness (Estimate = –1.52, p = .002). No significant effects were observed for age, gender, marital status, education, or income in predicting functional health categories. For more details, refer to Table 6.

Table (6): Ordinal Logistic Regression Analysis for Predictors of Physical and Functional Health Categories among Post-COVID-19 Patients (n = 150)

Model / Predictor	Estimate	Std. Error	Wald	df	p-value	95% CI (Lower–Upper)
Physical Category						
Age group (20–39 vs 60–79)	0.78	0.77	1.02	1	.31	–0.73 – 2.28
Age group (40–59 vs 60–79)	1.31	0.76	2.94	1	.09	–0.19 – 2.80
Gender (male vs female)	–0.15	0.39	0.14	1	.71	–0.92 – 0.63
Marital status (single vs widowed)	0.29	1.14	0.07	1	.80	–1.95 – 2.54
Marital status (married vs widowed)	0.59	1.08	0.30	1	.58	–1.52 – 2.70
Marital status (divorced vs widowed)	–0.43	1.93	0.05	1	.83	–4.20 – 3.35
Education (No formal vs Univ.+)	–2.00	0.81	6.05	1	.014*	–3.59 – –0.41
Education (Primary vs Univ.+)	–0.97	0.56	3.00	1	.08	–2.07 – 0.13
Education (Secondary vs Univ.+)	–0.83	0.52	2.53	1	.11	–1.85 – 0.19
Income (Low vs High)	–1.72	1.38	1.56	1	.21	–4.43 – 0.98
Income (Moderate vs High)	–0.53	1.31	0.16	1	.69	–3.10 – 2.05
Chronic illness (Yes vs No)	0.37	0.47	0.60	1	.44	–0.56 – 1.30
Functional Category						
Age group (20–39 vs 60–79)	–0.41	0.69	0.36	1	.55	–1.76 – 0.93
Age group (40–59 vs 60–79)	–0.45	0.67	0.46	1	.50	–1.76 – 0.86
Gender (male vs female)	0.63	0.37	2.89	1	.09	–0.10 – 1.35
Marital status (single vs widowed)	1.43	1.10	1.71	1	.19	–0.72 – 3.58
Marital status (married vs widowed)	1.47	1.04	2.02	1	.16	–0.56 – 3.51
Marital status (divorced vs widowed)	3.68	1.99	3.41	1	.07	–0.23 – 7.58
Education (No formal vs Univ.+)	–0.74	0.70	1.13	1	.29	–2.10 – 0.62

Education (Primary vs Univ.+)	0.19	0.49	0.15	1	.70	–0.77 – 1.14
Education (Secondary vs Univ.+)	–0.83	0.47	3.08	1	.08	–1.76 – 0.10
Income (Low vs High)	–0.10	1.24	0.01	1	.93	–2.53 – 2.32
Income (Moderate vs High)	–0.13	1.20	0.01	1	.91	–2.48 – 2.22
Chronic illness (Yes vs No)	–1.52	0.48	10.02	1	.002**	–2.45 – –0.58

Note: Ordinal regression was performed with logit link. *p < .05 significant; **p < .01 highly significant

Reference categories: Age group (60–79), Gender (female), Marital status (widowed), Education (University+), Income (High), Chronic illness (No).

The burden of functional and physical health issues among post-COVID-19 patients visiting public health facilities in Qaladiza City is revealed by this cross-sectional study. The majority of participants in our study had moderate levels of physical and functional impairment, suggesting that COVID-19's long-term effects pose a serious health risk to the population being studied. The most frequently reported physical symptoms included fatigue, pain in the joints, and headache, whereas the most frequently reported limitations included reduced work ability, the need to rest, and the need to take medication. The very high prevalence of fatigue observed in the present study is consistent with a substantial body of international evidence identifying fatigue as the hallmark symptom of post-COVID-19 condition. A previous clinical study reported that fatigue was present in up to 90.5% of patients with post-COVID syndrome [7]. This indicates that fatigue is one of the most common symptoms of long COVID. Another large study conducted between September 2021 and April 2022 found that about 73.5% of patients continued to experience fatigue several months after infection. [4]. This validates the current findings on the prevalence of fatigue in long COVID patients. Recently, a meta-analysis of over 17,000 patients found the pooled prevalence of post-COVID fatigue to be 46.6%. This shows that the symptom is common worldwide [16]. However, the current findings have a higher proportion of patients with fatigue, possibly due to differing patient populations and healthcare access.
Joint and muscle pain in this study was prominence. This finding is supported by previous studies. long-term follow-up studies have found that myalgia, joint pain, and muscle weakness are significantly associated with physical impairment in patients recovered from COVID-19 [16, 17]. In another study of 280 patients with post-acute COVID-19, it was found that musculoskeletal complaints are highly prevalent and that myalgia is present in 60.7% of patients [3]. These musculoskeletal manifestations are thought to result from persistent inflammatory activity, immune dysregulation, and post-viral physical deconditioning. In addition, neuromuscular studies have shown that there is impaired muscle function and weakness in patients with COVID-19 even one year after infection, which clearly indicates the biological basis of their persistent physical complaints [18]. Although the majority of the study participants fell in the moderate category, there were a considerable number of patients who had poor physical (7.3%) and functional (10.0%) outcomes. It is believed that this group of patients may be at the highest risk and may require more focused rehabilitation and care [19].

However, it is worth noting that this study clearly showed that there was coexistence of physical symptoms and functional limitations, and this is in agreement with previous studies on functional outcomes in patients with COVID-19, which clearly showed that there was a good correlation between fatigue and difficulties in performing daily activities in patients with COVID-19 [20]. In addition, other studies using the ICF model in the longitudinal follow-up of patients with COVID-19 clearly showed that there was a good association between fatigue and activity limitations in patients with COVID-19, such as performing multiple activities, lifting and carrying objects, and driving [17]. Likewise, in a cohort of 370 post-COVID syndrome patients assessed using the COVID-19 Yorkshire Rehabilitation Scale, symptom severity and functional difficulties were systematically evaluated on a 0–10 Likert scale. The findings demonstrated a strong positive correlation between symptom severity scores and functional difficulty scores ($r = 0.7$, 95% CI 0.6–0.7) [21]. This indicates that higher symptom burden was associated with greater impairment in functional ability. Moreover, the present research found education level as an influential variable related to physical health status. It was observed that participants with higher education levels had better physical health. While there are limited data on regional levels, this finding is in agreement with the results of large population-based studies on the COVID-19 pandemic, showing education level as a powerful predictor of health literacy in all age groups. Individuals with higher education consistently demonstrated significantly better health literacy levels compared with those with lower educational backgrounds [22]. This relationship suggests that education enhances individuals' ability to access, understand, and apply health information [23].

Additionally, this study's strong correlation between chronic illness and worse functional health is supported by prior research and is biologically plausible. Pre-existing conditions like lung disease, hypertension, and other

comorbidities have been found to be significant risk factors for functional impairment and persistent post-COVID fatigue in systematic analyses [24]. After an acute infection, chronic illnesses may prolong inflammatory reactions and lower physiological reserve, delaying full recovery. This emphasizes how crucial it is to give patients with comorbidities priority in post-COVID follow-up programs. On the other hand, prior studies have found no discernible differences between hypertensive and normotensive patients in important post-COVID symptoms like fatigue and dyspnea. However, that study did find that people with hypertension had worse sleep quality and a higher frequency of migraine-like headaches [25]. These mixed findings suggest that the impact of chronic conditions on post-COVID outcomes may vary across populations and outcome measures [26, 27, 28].

The comparatively high burden of moderate impairment seen in Qaladiza City may indicate deficiencies in long-term COVID services and structured rehabilitation when considered in the context of the region. Many international studies have been conducted in high-income settings with established post-COVID clinics, whereas access to multidisciplinary rehabilitation in resource-limited environments remains variable. Research on rehabilitation confirms that involvement in post-COVID rehabilitation is linked to improved functional status and health-related quality of life when compared to no rehabilitation [16;21]. Furthermore, among COVID-19 survivors, organised motor and respiratory rehabilitation programs have shown notable improvements in walking ability, functional independence, and symptom burden [29, 30]. The current cohort's persistent symptoms and functional limitations could be partially explained by this contextual difference.

The study's conclusions have significant ramifications for healthcare planning in Iraq's Kurdistan Region. It is necessary to improve post-COVID follow-up services in primary healthcare because a significant percentage of patients have persistent symptoms and activity limitations. Long-term disability may be decreased with early screening, targeted rehabilitation, and concentrated support for high-risk populations, especially those with chronic illnesses and lower educational attainment. This study also has several limitations. The cross-sectional design makes it difficult to determine causality and evaluate changes over time. Because patients seeking follow-up care may have more persistent symptoms, convenience sampling from public health facilities may have introduced selection bias. The reliability of subgroup comparisons may be limited by the small numbers in some subgroups, despite the overall sample size being sufficient. Furthermore, the single city setting may restrict generalizability, and relying solely on self-reported data may introduce recall bias. Notwithstanding these limitations, the current study emphasizes the critical need for integrated long-term care strategies for impacted patients and offers important baseline data on the functional and physical burden of post-COVID-19 conditions in Qaladiza City.

4- CONCLUSION

In conclusion, post-COVID-19 patients attending public health institutions in Qaladiza City continue to experience a notable burden of ongoing physical symptoms and functional difficulties. Fatigue, joint pain, and headache were the most common complaints and were closely associated with reduced ability to perform daily activities. Educational level and the presence of chronic illness played important roles in patients' recovery status. These findings underscore the importance of strengthening post-COVID follow-up care, expanding accessible rehabilitation services, and prioritizing support for high-risk groups in the Kurdistan Region of Iraq.

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