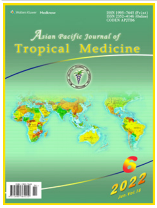

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Patterns in the relationship between acute COVID-19/long COVID-19 and quality of life: A cross-sectional study of patients attending a tertiary care hospital in Turkey

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ABSTRACT

Objective: To determine the change in the quality of life (QoL) of patients who applied to a tertiary outpatient clinic according to their COVID-19 status.

Methods: This cross-sectional study comprised 1370 participants. Short form-12 (SF-12), which includes Physical Component Summary (PCS) and Mental Component Summary (MCS) domains, was used to evaluate the QoL. Different linear regression models created using PCS-12 and MCS-12 were dependent variables.

Results: A total of 19.2% of participants had acute COVID-19, and 8.4% had long COVID-19. The most common sypmtoms were fatigue (72.6%), headache (42.5%), and joint pain (39.8%) in patients with long COVID-19. The model including all participants showed that long COVID-19 reduced the QoL in multivariate analysis for both MCS and PCS, while acute COVID-19 had no significant effect on the QoL comparing with those without COVID-19. Model that included participants with COVID-19 showed that long COVID-19 negatively affected the QoL in the multivariate model for PCS-12 and MCS-12. Variables that were significant in the multivariate model for those who had long COVID-19 were having a chronic disease and presence of ongoing symptoms. Females were disadvantaged for PCS-12 and MCS-12 in the multivariate models including all participants, and models including participants who have had COVID-19. Low educational group were disadvantaged for PCS-12 in the multivariate model including all participants. This group were also disadvantaged for PCS-12 and MCS-12 in the multivariate models including participants who had COVID-19.

Conclusions: In studies, acute COVID-19 and long COVID-19 should be treated as separate categories. The effects of long COVID-19 should be considered when providing and planning health services. The effect of gender, and education, on QoL shows that health inequalities continue to be effective during the pandemic period.

KEYWORDS: Long COVID-19; Acute COVID-19; Quality of life; Pandemic; Health ineaqualities

1. Introduction

The COVID-19 infection may induce liver, cardiac, and kidney injury, as well as other secondary infections and inflammatory responses. Moreover, microthrombi of the lungs, extremities, brain, and heart can be observed in patients with COVID-19[1]. The increased number of organs and systems affected by COVID-19 reveals the importance of its effects on the quality of life (QoL). Studies have shown the important negative effects of COVID-19

Significance

This study indicates that while acute COVID-19 does not negatively affect QoL, long COVID-19 negatively affects QoL in physical and mental areas. Females, and low education groups are more adversely affected by the impact of long-COVID-19 on the QoL. Since long-COVID-19 accounts for approximately one-third of all COVID-19 cases and has non-specific symptoms, it should be considered in the differential diagnosis also for patients presenting to general outpatient clinics.

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on the QoL[2,3].

According to The National Institute for Health and Care Excellence (NICE) in the UK, "long COVID-19" corresponds to the presence of signs and symptoms that continue or develop after an acute COVID-19 that is persisting for over 4 weeks. Therefore, it includes both ongoing symptomatic COVID-19 (from 4 to 12 weeks) and post-COVID-19 syndrome (12 weeks or more)[4]. Studies indicate that 10%-35% of those who have had COVID-19 experience long COVID-19[5–7]. It is known that long COVID-19 affects the patients' ability to return to their normal activities, and it was stated that a multidisciplinary approach is needed for its management[6]. Therefore, it is required to consider the effects of long COVID-19 on the QoL while investigating the effects of COVID-19 on the QoL.

Population-based studies regarding QoL have evaluated the effect of pandemic conditions and mobilization restrictions on the QoL[8–10]. Studies on the QoL in patients with COVID-19 mostly included patients followed up after discharge[11,12]. Moreover, QoL studies that consider acute COVID-19 and long COVID-19 groups as separate categories are less common, and current studies have compared these two categories without a control group[13,14]. Meanwhile, studies involving control and case groups have evaluated the effect without separating acute COVID-19 and long COVID-19 cases[15,16]. The relationship between QoL and COVID-19 can be more clearly demonstrated with study designs that include those who do not have COVID-19, those with acute COVID-19 and with long COVID-19 as separate categories.

Turkey is among the top ten countries in the world in terms of the total number of COVID-19 cases[17]. Considering the statistics of the pre-pandemic period, it is seen that for 2019, per capita visits to a physician (9.8) is well above the Organisation for Economic Co-operation and Development (OECD) average (6.6)[18]. The high number of cases and high demand for healthcare services make it important for Turkey to know the prevalence, clinical presentations, and QoL of long COVID-19 to enable the planning of healthcare services during and after the pandemic.

This study aimed to determine the change in the QoL of patients who applied to a university hospital outpatient clinic according to their disease histories based on the following categories: patients without COVID-19, those who have had acute COVID-19, and those who have had long COVID-19.

2. Subjects and methods

2.1. Study design and sampling

This is a cross-sectional study conducted on individuals over the age of 18 who applied to Gazi University Hospital. This hospital is a tertiary healthcare institution located in Ankara, the capital city of Turkey.

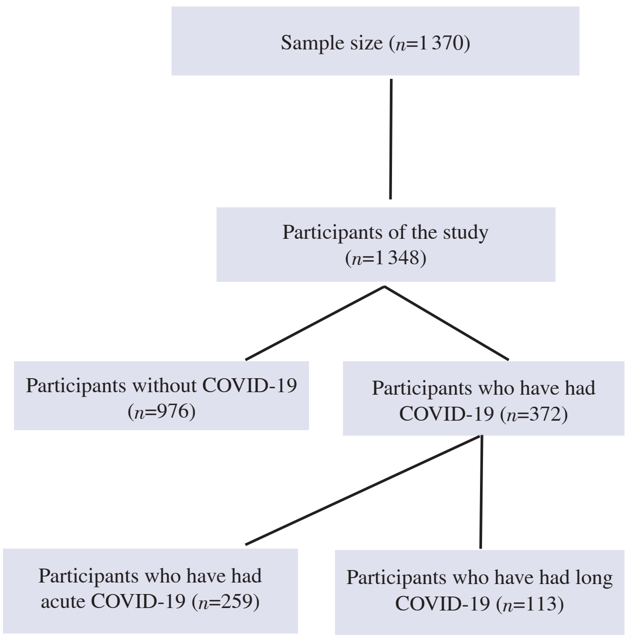

Figure 1. Flow diagram of the study.

Eighty thousand participants, which is approximately the total number of outpatient clinic applications per month, was accepted as the "population of study". Expected prevalence was accepted as 50% due to the unknown frequency, margin of error as 3%, and design effect as 1. Therefore, the sample size was calculated as 1 054. In the study, no substitute population was used for people who would be excluded from the research after the interview. Instead, it was aimed to attain 1 370 participants by increasing the sample size by 30%.

2.2. Implementation

Data collection was carried out through face-to-face interviews in October 2021. Participants were informed about the study, and informed consent was verbally obtained from 1 348 (94.9%) participants who were finally enrolled in this study (Figure 1).

2.3. Instrument

Short Form-12 (SF-12) was used to determine the QoL. The SF-12 is a scale developed as a shorter version of the Short Form-36 (SF-36) commonly used to measure QoL. SF-12 includes two summary measures including Physical Component Summary (PCS) and Mental Component Summary (MCS)[19]. The Turkish validity and reliability study of the scale was conducted. Cronbach alpha values have been found as 0.73 and 0.72 for PCS-2 and MCS-12 respectively. It was found that physical and mental components of the Turkish version of SF-12 were strongly correlated with the components of the SF-36[20]. PCS-12 and MCS-12 scores were calculated by algorithms prepared by the authors who developed the original scale[21].

Table 1. Participant characteristics and history of COVID-19.

Variables	*n* (%)
Gender (*N*=1 348)	
Female	731 (54.2)
Male	617 (45.8)
Educational level (*N*=1 348)	
Low level	374 (27.7)
High level	974 (72.3)
Income level (*N*=1 319)*	
Low level	1 093 (82.9)
High level	226 (17.1)
Have a social security (*N*=1 348)	
No	77 (5.7)
Yes	1 271 (94.3)
Have chronic disease (*N*=1 348)	
No	679 (50.4)
Yes	669 (49.6)
COVID-19 status (*N*=1 348)	
Participants without COVID-19	976 (72.4)
Participants who have had acute COVID-19	259 (19.2)
Participants who have had long COVID-19	113 (8.4)
Presence of history of long COVID-19 in patients with COVID-19 (*N*=372)	
Acute COVID-19	259 (69.6)
Long COVID-19	113 (30.4)
Presence of a history of hospitalization regarding COVID-19 (*N*=372)	
No	330 (88.7)
Yes	42 (11.3)
Presence of ongoing symptoms in patients with long COVID-19 (*N*=113)	
No	44 (38.9)
Yes	69 (61.1)
Presence of outpatient admission regarding long COVID-19 (*N*=113)	
No	46 (40.7)
Yes	67 (59.3)

*Only 1 319 participants answered the question about their income level. For education, “low level” includes “no formal education”, “primary school”, “secondary school”, and “high level” includes, “high school”, “university”; For income, “low level” includes “income is equal to or less than expenses”, and, “high level” includes income is more than expenses.

2.4. Variables and statistical analysis

Long COVID-19 was defined by the presence of ongoing or newly emerging complaints 4 weeks after the onset of the disease[4].Therefore, acute COVID-19 implies people who have had a COVID-19 disease that lasted for a month at most. We created a checklist using symptoms identified in a systematic review for long COVID-19[22].

Kruskal Wallis test was used for compare QoL scores of different COVID-19 status that are without COVID-19, participants who have had acute COVID-19, and participants who have had long COVID-19. For pairwise comparisons in the *post–hoc* analysis, Mann whitney *U* test with Bonferroni correction was used. *P*-value<0.017 was considered statistically significant for Mann whitney *U* test with Bonferroni correction.

We created different linear regression models for all applicants included in this study, those who have had COVID-19, and those who have had long COVID-19. The dependent variables of all linear regression models were the PCS-12 and MCS-12 scores. Age, gender, educational level, having social security, and having a chronic disease were common independent factors for all models. The categories of the variables included in the linear regression model were used as shown in Table 1.

For using linear regression model, we have categorized answers related educational level and income level. For education, “low level” includes, “no formal education”, “primary school”, “secondary school”, and “high level” includes, “high school”, “university”. For income, “low level” includes, “income is much less than expenses”, “income is little less than expenses”, “income is equal to expenses” and, “high level” includes, “income is little more expenses”, “income is much more expenses”.

The first model including all applicants including those without COVID-19. This model additionally included the COVID-19 status as an independent factor. We defined two dummy variables for this regression model, by considering people without COVID-19 as the reference group. For one of the dummy variables, patients with acute COVID-19 we coded as 1, the others as 0. For another one of the dummy variables, patients with long COVID-19 we coded as 1, the others as 0. We aimed to evaluate acute COVID-19 and long COVID-19 forms as two different categories by using dummy variables in the model that includes all participants in the study. The second model created for participants who have had COVID-19 (acute COVID-19 or long COVID-19) included the long COVID-19 status and history of hospitalization, in addition to the common independent variables. In this model, we aimed to evaluate effect of long COVID-19, identifying those with acute COVID-19 as the reference group. The third model created for participants who have had long COVID-19 included the number of symptoms regarding long COVID-19, presence of outpatient admission regarding long COVID-19, presence of ongoing symptoms, and history of hospitalization, in addition to the common independent variables.

Bivariate and multivariate models were created for PCS-12 and MCS-12. Variables that were statistically significant in the bivariate model were used in the multivariate model. While creating the regression models, “backward” was used as the “variable selection method.” We have used variables included by last step of the this selection method in the multivariate model when we created tables including regression analysis.

Type 1 error level was set at 0.05. Statistical analyses were performed using IBM SPSS Statistics for Windows version 23.0.

2.5. Ethical considerations

To conduct this study, approval was obtained from Gazi University Ethics Committee with research code number 2022–268.

3. Results

In total, 1 348 participants were enrolled, and 19.2% (259/1 348) of these participants had acute COVID-19, and 8.4% (113/1 348) had long COVID-19. In addition, 11.3% (42/372) of the patients with COVID-19 had a history of hospitalization. A total of 30.4% (113/372) of people with a history of COVID-19 have had long-COVID-19 (Table 1). Most common sypmtoms of long COVID-19 were fatigue (72.6%), headache (42.5%), joint pain (39.8%), anosmia (38.1%), and general pain (37.2%) (Table 2).

Because of scores of PCS-12 and MCS-12 does not follow normal distribution, we have shown median values of QoL scores according to COVID-19 status in the Table 3. There were statistical differences between the three types of COVID-19 statuses regarding PCS-12 (P=0.001) and MCS-12 scores (P=0.029). According to *post–hoc* analysis, there were no statistical differences between the participants who have had acute COVID-19 and participants without COVID-19 for PCS-12 (P=0.274) and MCS-12 scores (P=0.196). There was statistical difference between the participants without COVID-19 and participants who have had long COVID-19, for PCS-12 score (P=0.001), but there was no statistical difference for MCS-12 score (P=0.037). There were statistical differences between the participants who have had acute COVID-19 and participants who have had long COVID-19 for PCS-12 (P<0.001) and MCS-12 scores (P=0.006).

Table 4 shows the linear regression model of SF-12 for all participant of this study. In the bivariate regression analysis of PCS-12, the effects of all variables on the model were found to be statistically significant. In the multivariate model for PCS-12, the score was higher in male (standardized β : 0.145), further educational levels (standardized β : 0.234). In contrast, the score was lower in the advanced ages (standardized β : -0.273), those with chronic disease (standardized : -0.172), those haven't got social security(standardized β : -0.056), and those had with long COVID-19 (standardized β : -0.054). In the bivariate regression analysis of MCS-12, the effects of age, gender, having a social security, and having long COVID-19 were found to be statistically significant. In the multivariate model for MCS-12, the score was higher in the advanced ages (standardized β : 0.126), male (standardized β : 0.116). On the other hand, score was lower in those with chronic disease (standardized β : -0.071), and those had with long COVID-19 (standardized β : -0.055).

Table 2. Symptoms of long COVID-19 (N=113).

Variables	n	% (95% CI)
Fatigue	82	72.6 (63.4-80.5)
Headache	48	42.5 (33.2-52.1)
Joint pain	45	39.8 (30.7-46.8)
Anosmia	43	38.1 (29.1-47.7)
General pain	42	37.2 (28.3-46.8)
Dyspnea	36	31.9 (23.4-41.3)
Coughing	35	31.0 (22.6-40.4)
Attention disorder	22	19.5 (12.6-28.0)
Intermittent fever	21	18.6 (11.9-27.0)
Depression	19	16.8 (10.4-25.0)
Anxiety/feeling anxious or nervous	16	14.2 (8.3-22.0)
Post-activity polypnea	14	12.4 (6.9-19.9)
Weight loss	14	12.4 (6.9-19.9)
Sweating	13	11.5 (6.3-18.9)
Hair loss	10	8.8 (4.3-15.7)
Nausea or vomit	10	8.8 (4.3-15.7)
Digestive disorders	10	8.8 (4.3-15.7)
Chest pain/discomfort	9	8.0 (3.7-14.6)
Sleep disorder	8	7.1 (3.1-13.5)
Memory loss	5	4.4 (1.5-10.0)
Palpitation	5	4.4 (1.5-10.0)
Resting heart rate increase	3	2.7 (0.6-7.6)
Cutaneous signs	1	0.9 (0.0-4.8)
Hearing loss or tinnitus	1	0.9 (0.0-4.8)

Table 5 shows the linear regression model of SF-12 for participants. who had COVID-19. In the bivariate regression analysis of PCS-12, the effects of all variables, except of having a social security, on the model were found to be statistically significant. In the multivariate modelfor PCS-12, the score was higher in in male (standardized β : 0.090), higher educational levels (standardized β : 0.170). However, the score was lower in the advanced ages (standardized β : -0.205), those with chronic disease (standardized β : -0.204), those had long COVID-19 (standardized β : -0.119), and those with a history of hospitalization (standardized β : -0.152). In the bivariate regression analysis of MCS-12, the effects of gender, educational level, having long COVID-19, and history of hospitalization were found to be statistically significant. In the multivariate modelfor MCS-12, the score was higher in male (standardized β : 0.147) and higher income levels (standardized β : 0.104). However, the score was lower in those had long COVID-19 (standardized β : -0.108).

Table 6 shows the linear regression model of SF-12 for participants who have had long COVID-19. In the bivariate regression analysis of PCS-12, the effects of age, gender, educational level, having a chronic disease, presence of outpatient admission regarding long COVID-19, presence of ongoing symptoms, and history of hospitalization were found to be statistically significant. In the multivariate modelfor PCS-12, the score was higher in the higher educational levels (standardized β : 0.218). In contrast, the score was lower in the advanced ages (standardized β : -0.319), those with chronic disease (standardized β : -0.188), and those with ongoing symptoms (standardized β : -0.196). In the bivariate regression analysis of the MCS-12, the effect of all variables on the model was not statistically significant.

Table 3. Variation of quality of life scores according to the COVID-19 status.

COVID-19 status	Scores of qality of life	
	PCS-12 *	MCS-12 **
Participants without COVID-19	50.02 (15.02-64.02)#	44.83 (12.02-68.35)
Participants who have had acute COVID-19	50.93 (17.28-63.08)#	46.10 (20.02-62.59)▽
Participants who have had long COVID-19	45.08 (20.25-63.61)	39.51 (19.70-64.23)

Scores of PCS-12 and MCS-12 does not follow normal distribution and were expressed as median (IQR). *P=0.001 **P=0.029, comparison among participants without COVID-19, have had acute COVID-19 and long COVID-19, for PCS-12 and MCS-12, respectively, according to Kruskal Wallis test. #P<0.001 comparing with participants who have had long COVID-19 for PCS-12 score; ▽P=0.006 comparing with participants who have had long COVID-19 for MCS-12 scores.

Table 4. Linear regression model of SF-12 for all applicants included in the study.

Variables	PCS-12				MCS-12			
	β *	*P*	β **	*P*	β *	*P*	β **	*P*
Age	-0.428	<0.001	-0.273	<0.001	0.091	0.001	0.126	0.001
Gender (male/female, ref)	0.214	<0.001	0.145	<0.001	0.124	<0.001	0.116	0.001
Educational level (high/low, ref)	0.410	<0.001	0.234	<0.001	0.022	0.409	–	–
Income level (high/low, ref)	0.130	<0.001	0.038	0.099	0.051	0.065	0.050	0.069
Have a social security (no/yes, ref)	-0.054	0.048	-0.056	0.016	0.066	0.015	-0.050	0.069
Have chronic disease (yes/no, ref)	0.359	<0.001	-0.172	<0.001	-0.036	0.192	-0.071	0.017
COVID-19 status								
Acute COVID-19/without COVID-19, ref	0.055	0.043	–	–	0.049	0.069	–	–
Long COVID-19/without COVID-19, ref	0.100	<0.001	-0.054	0.017	-0.060	0.026	-0.055	0.043

*Standardized β (bivariate), **Standardized β (multivariate). "–": variables are removed from the model, since "backward" was used as the variable selection method for creating the regression models.

Table 5. Linear regression model of SF-12 for participants who have had COVID-19.

Variables	PCS-12				MCS-12			
	β *	*P*	β **	*P*	β *	*P*	β **	*P*
Age	0.439	<0.001	-0.205	<0.001	0.047	0.366	–	–
Gender (male/female, ref)	0.151	0.003	0.090	0.045	0.153	0.003	0.147	0.005
Educational level (high/low, ref)	0.383	<0.001	0.170	0.001	0.130	0.012	0.104	0.048
Income level (high/low, ref)	0.108	0.041	–	–	0.096	0.068	–	–
Have a social security (no/yes, ref)	0.057	0.271	–	–	0.059	0.255	–	–
Have chronic disease(yes/no, ref)	0.395	<0.001	-0.204	0.001	0.042	0.421	–	–
Status of long COVID-19								
Long COVID-19/without long COVID-19, ref	0.208	<0.001	-0.119	0.008	0.144	0.006	-0.108	0.039
History of hospitalization (yes/no, ref)	0.308	<0.001	-0.152	0.001	0.109	0.036	–	–

*Standardized β (bivariate), **Standardized β (multivariate). "–": variables are removed from the model, since "backward" was used as the variable selection method for creating the regression models.

Table 6. Linear regression model of SF-12 for participants who have had long COVID-19.

Variables	PCS-12			
	β *	*P*	β **	*P*
Age	0.518	<0.001	-0.319	<0.001
Gender (male/female, ref)	0.240	0.010	0.135	0.081
Educational level (high/low, ref)	0.432	<0.001	0.218	0.008
Income level (high/low, ref)	0.178	0.061	–	–
Have a social security (no/yes, ref)	0.058	0.540	–	–
Having a chronic disease (yes/no, ref)	0.439	<0.001	-0.188	0.025
Number of symptoms regarding the long COVID-19 (yes/no, ref)	0.166	0.078	–	–
Presence of outpatient admission regarding long COVID-19 (yes/no, ref)	0.263	0.005	–	–
Presence of ongoing symptoms (yes/no, ref)	-0.365	<0.001	-0.196	0.011
History of hospitalization (yes/no, ref)	-0.376	<0.001	–	–

*Standardized β (bivariate), **Standardized β (multivariate). "–": variables are removed from the model, since "backward" was used as the variable selection method for creating the regression models.

4. Discussion

During the pandemic, studies naturally focused on the clinical presentation, pathogenesis, and treatment of patients with acute COVID-19. However, studies on the consequences of acute and long COVID-19 are also needed. QoL is frequently used in the evaluation of the effects of health behaviors, diseases, and disability[23].

4.1. Prevalence and clinical presentation of long COVID-19

Approximately one out of every five participants who applied to tertiary outpatient clinics declared that they had COVID-19 and one out of ten had long COVID-19, in October 2021, the period when the study was carried out. This finding showed that, among the outpatients, those who had COVID-19 were quite common. In our study, 30.4% of those who declared that they had COVID-19 stated that their complaints lasted more than one month, in accordance with the definition of long COVID-19. It has been reported that long COVID-19 occurs in 10%-35% of those with COVID-19, similar to the results of our study[5,6,24].

In our study, the most common sypmtoms declared by patients with long COVID-19 were fatigue (72.6%), headache (42.5%), joint pain (39.8%), anosmia (38.1%), and general pain (37.2%). In a meta-analysis involving 47 910 individuals, the most common symptoms were fatigue (58%), headache (44%), attention disorder (27%), hair loss (25%), and dyspnea (24%)[22]. In a systematic review including 9 751 people, the most common symptoms were stated as dsypnea (36.0%), fatigue (40.0%), and sleep disorders (29.4%). It is stated that there is great variation in the design and quality of the studies, and most of the studies included post-discharged patients[22,25]. The fact that the symptoms vary widely in type and frequency reveals the number of different complaints physicians should consider to diagnose long COVID-19.

4.2. Effects of COVID-19 on the quality of life

Although there was a significant difference in QoL scores between the three types of COVID-19 status, the fact that there was no significant difference between participants who have had acute COVID-19 and those without COVID-19 in paired comparisons in the *post-hoc* test indicates that there are different patterns in the effect of the disease on QoL. Multivariate analyzes were performed to detail this result obtained by bivariate analysis.

Participants who have had acute COVID-19 and participants who have had long COVID-19 were defined as dummy varibles in the regression model including all participants. Thanks to this method, we were able to analyze the effects of acute COVID-19 and long COVID-19 separately, using non-COVID-19 participants as references. This model showed that long COVID-19 reduced QoL in both bivariate and multivariate analysis for both MCS-12 and PCS-12. While acute COVID-19 does not adversely affect the QoL, it is noteworthy that long COVID-19 reduces the QoL related to physical and mental health. This result may be important in that it shows that different prognoses of COVID-19 lead to different outcomes.

Participants with acute COVID-19 had a higher PCS-12 score only in the bivariate model. Apart from this, having a history of acute COVID-19 did not affect the QoL. The higher PCS-12 score in those with COVID-19 may be due to the higher prevalence of COVID-19 among young people due to social mobilization restrictions for the elderlyduring the pandemic.

Studies comparing groups with and without COVID-19 in terms of QoL show the disruptive effect of disease. In a study with SF-36, a difference was found for all domains of the scale[16]. In studies conducted with the EQ-5D, it was determined that the score was lower in those with COVID-19[15,26]. In one study, a difference was found in the physical domain one month after discharge, but not in the mental domain, and no difference was found in either domain after 3 months[27]. In some studies, a comparison was made by questioning for the period before and after COVID-19. A study using the EQ-5D found a significant difference 3 months after contracting COVID-19[28], while another study conducted after 6 months found no difference[29]. Studies generally determined the negative effect of COVID-19 on the physical and mental components of QoL, while also pointing out that the effect may decrease over time. In these studies, the effect was investigated without distinction of acute and long COVID-19. Our study indicates that different results can be obtained by evaluating the effects of acute and long COVID-19 separately.

4.3. Determinants of quality of life for those who had COVID-19

Model that included participants who have had COVID-19 showed that long COVID-19 negatively affected the QoL in the bivariate and multivariate analysis for PCS-12 and MCS-12. The fact that long COVID-19 was found to be effective in this model, while the reference category was people with acute COVID-19, shows the magnitude of the effect of long COVID-19 on the QoL.

In some studies, the QoL scores of patients with acute and long COVID-19 were compared. In a study comparing two symptomatic and asymptomatic groups with SF-12, 12 months after the illness, significant differences were found between the groups for both PCS and MCS[14]. In a study conducted in postCOVID-19 clinic patients, the PCS component score of SF-12 was lower in patients with long COVID-19 in the first year of follow-up compared to those without[13]. According to another study, QoL scores (by EQ-5D) were lower in the long COVID-19 group, even after adjusting for background characteristics[30]. It is seen that the effects of acute and long COVID on the QoL are different. Evaluating the effects of acute and long COVID-19 separately, as in our study and some similar studies, may reveal different patterns in the relationship between COVID-19 and QoL.

Hospitalization history negatively affects QoL in bivariate and multivariate analyzes for PCS-12 and bivariate analysis for MCS-12. Similar to our study, it has been shown that QoL scores were lower in hospitalized patients[31–33]. In addition, it is also been shown that longer hospitalization were independently associated with impaired QoL[34]. History of hospitalization can be evaluated as a risk factor for the decrease in the QoL.

Having a chronic illness negatively affects the PCS. Different studies converge with the conclusion that the QoL is worse in patients with comorbid COVID-19[31,33,35–37]. This result reveals that the effects of COVID-19 may be more severe in those with chronic diseases.

Low education groups and females are disadvantaged for the PCS and MCS in the multivariate analysis. Elderlies are disadvantaged for the PCS. While there is one example of a study that found men to be more disadvantaged[31], numerous studies indicate that women are more disadvantaged[2,28,32,35–37]. According to one of the explanationsregarding this relationship, women tend to report poorer health as they are more conscious about their health[37]. There is no clear mechanism that explains why women are disadvantaged. Therefore, there is a need to explore the role of gender on the relationship between COVID-19 and QoL. However, regardless of the mechanism, most of studies have determined that women are the risk group, revealing that the pandemic has a function that reinforces gender inequality.

Studies indicate that the QoL is worse in the elderly who have a history of COVID-19[2,31–33,35,36]. This result justifies additional warnings and precautions for the elderly regarding the disease. Similar to our results, there are studies that have found that QoL is worse in low education[33,35]. These results prove that the pandemic also functions to reproduce health inequalities.

Our study shows that long COVID-19 also negatively affects mental health.A meta-analysis found that the pooled prevalence of post traumatic stress disorder, depression, and anxiety among COVID-19 survivors were 18%, 12%, and 17%, respectively[38]. Mental diseases detected in those with COVID-19 may be the factors mediating the relationship we found. Identifying the factors that mediate low QoL may contribute to improving the management of COVID-19.

4.4. Determinants of quality of life for those who had long COVID–19

According to the model of factors predicting PCS, the presence of outpatient admission regarding long COVID-19 and history of hospitalization were significant in the bivariate analysis but nonsignificant in the multivariate analysis. Meta-analysis including patients with post-COVID-19 showed that poor QoL was significantly higher among patients with Intensive Care Unit admission[12]. It can be said that a person's QoL may vary at different treatment levels, corresponding to patients of different weights. Rehabilitation of patients with long COVID-19, especially those who have received ICU service, can help improve the QoL.

Variables that are effective in both bivariate and multivariate analysis include having a chronic disease and presence of ongoing symptoms. The continuation of the deterioration in QoL as the complaints persist reveals the determining effect of the duration of long COVID-19.

More than half of long COVID-19 patients applied to the outpatient clinic due to complaints lasting more than 1 month. A study found that 40% of participants reported at least one general practitioner visit related to COVID-19 after acute illness[32]. Patients with long COVID-19 account for the increasing demand of healthcare services. When planning treatment and rehabilitation services, the characteristics of long COVID-19 patients using health services should be taken into account[39].

4.5. Limitations

One limitation is that this study used a cross-sectional study design. Thus, the causality relationship can be revealed more clearly with cohort studies. Self-reported detection of acute and long COVID-19 is another limitation. The fact that there are people who do not answer the question about their income level is also among the limitations of this study.

5. Conclusions

Long COVID-19 symptoms are very diverse and nonspecific, and patients may apply to different outpatient clinics due to these complaints. For patients with a history of COVID-19, it would be useful to consider long COVID-19 in the differential diagnosis. While acute COVID-19 has no effect, long COVID-19's negative physical and mental effects on QoL show that there may be different patterns in the outputs of different forms of COVID-19.In studies on COVID-19, it may be recommended to evaluate patients with acute COVID-19 and long COVID-19 as separate groups. Since approximately one-third of COVID-19 survivors have long COVID-19, and due to the magnitude of its negative impact on QoL, it will be important to consider patients with long COVID-19 when planning healthcare services. Women, and low education, groups are the groups that are disadvantaged in terms of QoL. Health promotion programs that primarily target disadvantaged social groups will contribute to the development of equity in health.

Conflict of interest statement

We declare that we have no conflict of interest.

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Authors' contributions

HT, CÖ, and FNBA have designed study. HT, BB, GA have studied for literature search. BB and GA have studied for data acquisition. HT, CÖ, and BB have performed statistical analysis. HT have drafted manuscript. HT, BB have edited manuscript. FNBA supervised the study. All authors approved the final version of the manuscript.

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