Assessment of health-related quality of life and its determinants among COVID-19 intensive care unit survivors

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Abstract

Background: Health-related quality of life (HRQoL) is a multidimensional concept encompassing the physical, functional, emotional, and social/family well-being of an individual. Recent reports suggest that Covid-19 may lead to poorer HRQoL of the patients infected both in the short and long term. The present study aimed to assess the health-related quality of life and their determinants among COVID-19 intensive care unit (ICU) survivors. **Materials and Methods:** In the study, 107 COVID-19 (RTPCR positive) patients admitted to the (ICU) of a tertiary care centre from August 2021-January 2022 were taken from the hospital records. Line listing of all the patients was done, and the study population was selected using the lottery method under a simple random sampling method. The study population was contacted by telephone and requested their willingness to participate in the study. EQ-5D-5L was used to assess quality of life, which is a standard instrument to assess HRQoL (developed by the EuroQol group in 2011). The EQ-5D-5L essentially consists of the EQ-5D descriptive system and the EQ visual analogue scale (EQ-VAS). Data entry was done using Microsoft excel 2019 version and data analysis using MedCalc version 20.015. **Results:** The mean EQ-5D-5L utility score was 0.51 ± 0.43. The mean EQ-VAS score was 68.97 ± 22.27. A significant association between co-morbidities and EQ-5D-5L utility score where those with co-morbidities had a lesser EQ-5D-5L score compared to those without co-morbidities. The mean duration of ICU stay in days was 12.29 ± 12.17. A significant negative correlation between the duration of ICU stay and EQ-5D-5L. ($r = -0.26$, $P = 0.0006^*$). **Conclusion:** COVID-19 patients with comorbidities had a significantly poor quality of life. These findings may help healthcare professionals and decision-makers to better understand the consequences of COVID-19 on the HRQoL.

Keywords: COVID-19, EQ-5D-5L, health-related quality of life, ICU survivors

Introduction

World Health Organization (WHO) defines Quality of Life (QoL) as "a composite measure of physical, mental and social well-being as perceived by each individual or by a group of individuals – that is to say, happiness, satisfaction, and gratification as it is experienced in such life concerns as health, marriage, family work, financial situation, educational opportunities, self-esteem, creativity, belongingness, and trust in others".[1]

Health-related QoL (HRQoL) is a multidimensional concept encompassing the physical, functional, emotional, and social/family well-being of an individual.[2,3] Physical well-being in this context refers to symptoms related to disease (e.g., pain, nausea, and fatigue) and the side effects of treatment (e.g., limb volume

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Quick Response Code:

Website:
http://journals.lww.com/JFMPC

DOI:
10.4103/jfmpc.jfmpc_739_23

How to cite this article: Neelima M, Chivukula SK. Assessment of health-related quality of life and its determinants among COVID-19 intensive care unit survivors. J Family Med Prim Care 2023;12:3319-25.

Table 1: Data value sets for the EQ-5D values adopted in the study are[18]	
	Utility value
Mobility	
MO1	1
MO2	0.0497
MO3	0.0492
MO4	0.1553
MO5	0.1333
Self-care	
SC1	1
SC2	0.0513
SC3	0.0793
SC4	0.1709
SC5	0.0784
Usual activity	
UA1	1
UA2	0.0455
UA3	0.0431
UA4	0.1529
UA5	0.0824
Pain/discomfort	
PD1	1
PD2	0.0514
PD3	0.0741
PD4	0.2643
PD5	0.1945
Anxiety/depression	
AD1	1
AD2	0.0163
AD3	0.0464
AD4	0.1009
AD5	0.0835

change). Functional well-being includes an individual's ability to perform activities of daily living (e.g., walking, bathing, and dressing oneself) and in a societal role. Emotional well-being is a measure of coping ability and reflects the experience of feelings ranging from enjoyment to distress, and social well-being reflects the quality of relationships with family and friends and more comprehensive social interactions.[3-6]

Coronavirus disease 2019 (Covid-19) is first discovered in China's Wuhan Province in December 2019. According to the WHO, Globally, as of 8 February 2022, there have been 396,558,014 confirmed cases of COVID-19, including 5,745,032 deaths, reported to WHO.[7]

It is well-established that Covid-19 causes a wide variety of symptoms.[8] It may cause prolonged illness and persistent symptoms in the elderly and individuals with underlying conditions, but also in young adults and people with no or few chronic underlying medical conditions.[9] Recent reports suggest that some patients may develop medical complications, and 11%–24% of Covid-19 patients may experience long-term symptoms even after three months from the onset of Covid-19 illness.[10,11] Because of the above reasons, Covid-19 may lead to

poorer HRQoL of the patients infected both in the short- and long-term.

In COVID-19 hospitalized individuals, the mobility (MO), self-care (SC), and usual activity (UA) dimensions all showed improvement, but the pain and depression/anxiety domain impairment persisted for another six months.[12] Several determinants such as age, gender, employment status, comorbidities, health status, and socio-economic factors have been reported to influence HRQoL in Covid-19 infected individuals.[13-15]

There are several HRQoL measurement tools, some of which are generic and some disease-specific. Generic HRQoL tools (e.g., SF-36 (36-item Short-Form Health Survey), SF-6D (Short-Form 6 Dimension) derived from the SF-36, and EQ-5D (EuroQol-5 Dimension)) are widely used to assess multidimensional domains of the health and well-being of different populations.[16]

The present study intended to assess the health-related quality of life among COVID-19 intensive care unit (ICU) survivors.

Materials and Methods

Study design
A cross-sectional study.

Study setting
Hospital-based study.

Source of data
COVID-19 (RTPCR positive) patients admitted to the ICU of a tertiary care centre during August 2021-January 2022.

Place of study
Krishna District, Andhra Pradesh.

Study period
2 months (June 2022-July 2022).

Sample size estimation
Out of the total COVID-19, ICU admissions to the tertiary care hospital from August 2021–January 2022, hospital records from 535 patients were acquired from the hospital's medical records department.

For the present study, 20% of the total sample was considered as the sample size, that is, 20% of 535 is 107 was studied.

Selection criteria
Inclusion criteria
1. COVID-19 (RTPCR positive) patients admitted to the ICU of a tertiary care centre during August 2021-January 2022.
2. Age >40 years.

3. Patient residence within a 20 km radius of the tertiary care centre.

Exclusion criteria
1. Those who are not willing to participate in the study.
2. Patients who died after being discharged from the ICU.

Method of data collection

A cross-sectional study was carried out where details of COVID-19 (RTPCR positive) patients admitted to the ICU of a tertiary care centre from August 2021-January 2022 were taken from the hospital records. Line listing of all the patients was done, and the study population was selected using the lottery method under a simple random sampling method. The study population was contacted by telephone and requested their willingness to participate in the study. Once after receiving the willingness, their current residential address was taken to conduct a home visit. Informed consent was taken from the study participant before administering the questionnaire.

A pretested semi-structured questionnaire was administered where demographic details including age, gender, education, socio-economic status, co-morbidity profile, and vaccination status at the time of admission to the intensive care unit were collected from the study participant. Laboratory parameters include C-Reactive protein, D-Dimer levels at the time of admission to the intensive care unit, and duration of ICU stay were recorded from hospital medical records.

In this study, EQ-5D-5L was used to assess quality of life, which is a standard instrument to assess HRQoL (developed by the EuroQol group in 2011).[17] The EQ-5D-5L essentially consists of the EQ-5D descriptive system and the EQ visual analogue scale (EQ-VAS).

The EQ-5D-5L descriptive system comprises five dimensions: Mobility, self-care, usual activities, pain/discomfort (PD), and anxiety/depression (AD). Each dimension has five levels: No problems, slight problems, moderate problems, severe problems, and extreme problems. The patient is asked to indicate his/her health state by ticking the box next to the most appropriate statement in each of the five dimensions. This decision results in a 1-digit number that expresses the level selected for that dimension. The digits for the five dimensions can be combined into a 5-digit number that describes the patient's health state.

The data set for EQ-5D values was based on the Indian values published in the article titled "Development of an EQ-5D Value Set for India Using an Extended Design (DEVINE) Study: The Indian 5-Level Version EQ-5D Value Set".[18]

EQ-5D-5L health states the maximum value was 1.000 for full health (health state "11111") followed by the health state "11112" with a value of 0.984. The minimum value was −0.923 for the "55555" state.

Example: To obtain utility value for an EQ-5D-5L health state, for example, "12345", the following calculation based on the hybrid model (final value set) published in Gaurav Jyani *et al.*[18] study: Utility value ("12345") = 1 – no problems in MO (0) – no problems to slight problems in SC (0.0513) – no problems to slight problems in UA (0.0455) – slight problems to moderate problems in UA (0.0431) – no problems to slight problems in PD (0.0514) – slight problems to moderate problems in PD (0.0741) – moderate problems to severe problems in PD (0.2643) – no problems to slight problems in AD (0.0163) – slight problems to moderate problems in AD (0.0464) – moderate problems to severe problems in AD (0.1009) – severe problems to extreme problems in AD (0.0835) = 0.2232 [Table 1].

The EQ-VAS records the patient's self-rated health on a vertical visual analogue scale, where the endpoints are labelled 'The best health you can imagine' and 'The worst health you can imagine.' The VAS can be used as a quantitative measure of health outcomes that reflect the patient's own judgment. Ethical committee approval from the institutional Ethics Committee was acquired before the start of the study. Patient confidentiality was maintained.

Statistical analysis

The data entry was done using Microsoft Excel 2019 version and data analysis using MedCalc version 20.015. Quantitative data were expressed in mean and standard deviation and qualitative data were expressed in frequencies and percentages. T-test and Chi-square test were done to find the significant association between the two groups. A *P*-value of <0.05 was considered statistically significant.

Results

In the present study, The majority belong to the 51–60 years age group (36.4%) followed by the 41–50 years age group (26.2%). The mean age of the study population in years was 55.24 ± 9.94. Based on gender, 66.4% were male and 33.6% were female. In the study, 25.2% were illiterates. Based on socio-economic status using a modified Kuppuswamy scale where 29% belonged to the upper lower class, 25.2% to the lower middle, and 15.9% to the lower class. Based on comorbidities, 52.3% were known Diabetics, 39.2% were Hypertensives, 3.7% were diagnosed with Hypothyroidism, and 6.5% are Asthmatics.

In the present study, under the mobility component, 23.4% had no problems, 15% had slight problems, 33.6% had moderate problems, 21.5% had severe problems, and 6.5% had extreme problems [Table 2]. The mean EQ-5D-5L utility score in the present study was 0.51 ± 0.43. The mean EQ-VAS score was 68.97 ± 22.27.

The study found a significant association between co-morbidities and EQ-5D-5L utility score where those with co-morbidities had a lesser EQ-5D-5L score compared to those without
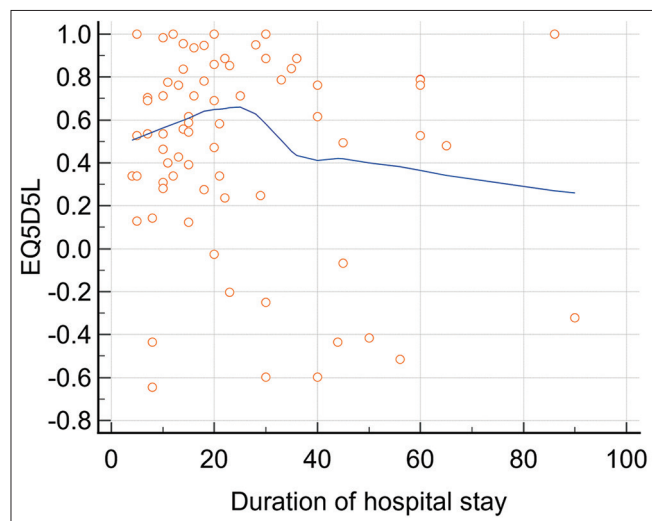
co-morbidities. EQ VAS shows a lower VAS score among those with co-morbidities. This observation was statistically significant ($P < 0.05*$) [Table 3].

The mean duration of hospital stay in days was 23.09 ± 17.76. The study observed a significant negative correlation between the duration of hospital stay and EQ-5D-5L. ($r = -0.20$, $P = 0.03*$) [Figure 1]. In the study, among 63.6% of cases, the length of stay in the intensive care unit was less than ten0 days, whereas, in 36.4% of cases, it was more than 11 days. The mean duration of ICU stay in days was 12.29 ± 12.17. A significant negative correlation between the duration of ICU stay and EQ-5D-5L. ($r = -0.26$, $P = 0.0006*$) [Figure 2].

The study did not find a significant correlation with relation to C reactive protein (CRP) ($r = 0.09$; $P = 0.33$) and D Dimer levels ($r = 0.03$; $P = 0.75$) at admission into ICU and utility score.

Table 4 shows distribution based on COVID-19 vaccination status at the time of admission where 58.9% had received 1 dose of COVID-19 vaccine and 41.1% received complete vaccination.

Table 5 shows an association between COVID-19 vaccination status and EQ-5D-5L utility score where those with partial vaccination had a lesser EQ-5D-5L score compared to those with complete vaccination. This observation was statistically significant ($P < 0.05*$).

Factors associated with the mobility component of EQ-5D-5L

In the study variables affecting mobility include Age (OR = 0.41, 95% CI: 0.14-1.20), Gender (OR = 0.71, 95% CI = 0.26-1.90), Education (OR = 0.50, 95% CI = 0.18-1.31), Diabetes mellitus (OR = 1.01, 95% CI = 0.41-2.49), Hypertension (OR = 0.77, 95% CI = 0.31-1.91), Hypothyroid (OR = 2.92, 95% CI = 0.15-56.17), Asthma (OR = 1.89, 95% CI = 0.21-16.53), Duration of stay in hospital in days (OR = 1.46, 95% CI = 0.49-4.38), Duration of ICU stay in Days (OR = 0.97, 95% CI = 0.38-2.47). None of the factors was significantly associated with the mobility component.

Factors associated with self-care component of EQ-5D-5L

Factors affecting self-care include Age (OR = 1.41, 95% CI: 0.58-3.39), Gender (OR = 1.04, 95% CI = 0.44-2.44), Education (OR = 0.62, 95% CI = 0.25-1.54), Diabetes mellitus (OR = 1.25, 95% CI = 0.55-2.80), Hypertension (OR = 1.14, 95% CI = 0.49-2.62), Hypothyroid (OR = 1.47, 95% CI = 0.14-14.74), Asthma (OR = 1.23, 95% CI = 0.22-6.68), Duration of stay in hospital in days (OR = 1.99, 95% CI = 0.72-5.49), Duration of ICU stay in Days (OR = 1.25, 95% CI = 0.54-2.88). None of the factors was significantly associated with the self-care component.

Figure 1: Correlation between duration of hospital stay in days and EQ-5D-5L
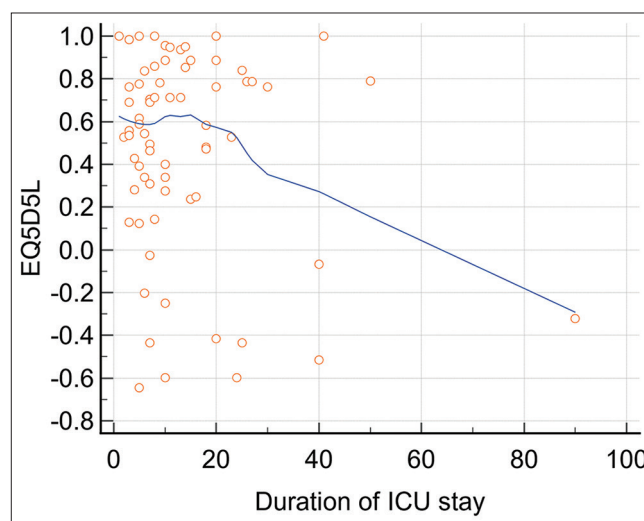
Figure 2: Correlation between duration of ICU stay in days and EQ-5D-5L

Table 2: EQ-5D-5L descriptive analysis									
	Mobility		Self-care		Usual activities		Pain/discomfort		Anxiety/depression
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
No problems	25	23.4%	35	32.7%	46	43%	33	30.8%	28	26.2%
Slight problems	16	15%	27	25.2%	22	20.6%	19	17.8%	18	16.8%
Moderate problems	36	33.6%	27	25.2%	27	25.2%	33	30.8%	38	35.5%
Severe problems	23	21.5%	9	8.4%	12	11.2%	17	15.9%	14	13.1%
Extreme problems	7	6.5%	9	8.4%	0	0%	5	4.7%	9	8.4%

Table 3: Association between co-morbidities and EQ-5D-5L				
	Co-morbidities		t-test	P
	Yes (n=69)	No (n=38)		
EQ-5D-5L	0.44±0.50	0.64±0.23	2.33	0.02*
EQ VAS	64.34±25.29	77.36±11.55	3.01	0.003*

*Statistically significant

Table 4: COVID-19 vaccination status at admission		
	Frequency	Percentage
Partial vaccination (1 dose)	63	58.9%
Complete vaccination (2 doses)	44	41.1%
Total	107	100%

Table 5: COVID-19 vaccination status at admission and EQ-5D-5L				
	Partial (n=63)	Complete (n=44)	t	P
EQ-5D-5L	0.43±0.48	0.62±0.32	2.29	0.02*

*Statistically significant; Test used=unpaired t-test

Factors associated with Pain/Discomfort component of EQ-5D-5L

Factors affecting pain/discomfort include Age (OR = 1.24, 95% CI: 0.51-3.01), Gender (OR = 0.98, 95% CI = 0.41-2.22), Education (OR = 0.44, 95% CI = 0.17-1.10), Diabetes mellitus (OR = 0.87, 95% CI = 0.38-2.00), Hypertension (OR = 0.82, 95% CI = 0.35-1.90), Hypothyroid (OR = 0.43, 95% CI = 0.05-3.19), Asthma (OR = 7.44, 95% CI = 0.41-134.29), Duration of stay in hospital in days (OR = 1.16, 95% CI = 0.45-2.96), Duration of ICU stay in Days (OR = 0.69, 95% CI = 0.29-1.60). None of the factors was significantly associated with the pain/discomfort component.

Factors associated with Anxiety/Depression component of EQ-5D-5L

Factors affecting anxiety/depression include Age (OR = 1.09, 95% CI: 0.43-2.74), Gender (OR = 1.13, 95% CI = 0.45-2.79), Education (OR = 1.01, 95% CI = 0.37-2.74), Diabetes mellitus (OR = 1.13, 95% CI = 0.47-2.68), Hypertension (OR = 0.66, 95% CI = 0.27-1.60), Hypothyroid (OR = 1.06, 95% CI = 0.10-10.68), Asthma (OR = 0.87, 95% CI = 0.16-4.80), Duration of stay in hospital in days (OR = 1.77, 95% CI = 0.59-5.25), Duration of ICU stay in Days (OR = 2.16, 95% CI = 0.89-5.20).

Table 6 found that Education* (OR = 2.98, 95% CI = 1.21-7.38) was significantly associated with the usual activities component of EQ-5D-5L.

Discussion

Health-related quality of life refers to the impact of disease and treatment on patients' function and overall life satisfaction. The EQ-5D-5L questionnaire is a generic and preference-based tool to describe and quantify HRQOL based on the patient's perspective of their health. It describes the HRQOL status in five dimensions with five levels each and a visual analogue scale. In the present study, the mean EQ-5D-5L utility score was 0.51 ± 0.43 (−0.646 to 1). In the study by Barani et al.,[19] the mean EQ-5D-5L utility score was 0.925 ± 0.150, and in Emrani et al.[20] it was 0.79 ± 0.17.

In the present study, the mean EQ-VAS score was 68.97 ± 22.27 that is higher than the study findings of Barani et al.[19] that was 90.68 ± 11.81.

In a Norwegian study conducted by Garratt et al.[21] reported that in the youngest to oldest age groups, there was a general decline in health as assessed by the EQ-5D-5L. On the contrary, the present study of 41-50 years observed a lower EQ-5D-5L utility score (0.37 ± 0.51). This may be due to anxiety/depression, where the youngest age groups had the poorest health.

Garratt et al.[21] reported that the scores fall for the age group 40-49 years, increase for the age groups 50-59 and 60-69, and decrease in the oldest age groups that is comparable to our study. Higher levels of anxiety/depression in the youngest age groups were also found in the youngest age groups in four Asian countries and Slovenia.[22-24]

In the present study, the mean EQ-5D-5L score among males was 0.51 ± 0.43 and among females was 0.50 ± 0.44. Males had a slightly higher EQ-5D-5L score compared to females. Similar findings were reported by Barani et al.[19] where among males it was 0.94 ± 0.13, and among females, it was 0.91 ± 0.17. Emrani et al.[20] reported that females had lower utility scores than males. The average score of men was 0.83 ± 0.16 while the average score of women was 0.76 ± 0.17. Goudarzi et al. indicated that in all dimensions, females had more problems than males,[25] which were also confirmed by other studies.[26]

The present study observed lower EQ-5D-5L scores among those with co-morbidities (0.44 ± 0.50). Barani et al.[19] reported that individuals with comorbidities requiring longer hospitalization were having lower utility scores than their counterparts. Nandasena et al.[27] reported that among diabetes, significantly lower quality of life was observed. Type 2 diabetes adversely affects the quality of life of patients. Uncontrolled disease and comorbidities can further compromise the quality of life. In a study by Paresh Parik et al.[28] reported that a significant difference between controlled and uncontrolled diabetics – EQ 5D 5L indices 0.85 and 0.70, respectively, (P = 0.00) was observed. The present study observed significantly higher EQ-5D-5L utility scores among those who received a complete dose (2 doses) of the COVID-19 vaccine. Table 7 shows comparison of EQ-5D-5L scores of the present study with similar studies.

Conclusion

SARS-CoV-2 has had a lasting effect on the overall health of recovered patients, called 'long COVID'. COVID-19 has posed

	Usual activities		ODDS ratio	P
	Slight to extreme (*n*=61)	No problem (*n*=46)		
Age				
≤50	34	12	2.60 (1.16-5.83)	0.15
≥51	37	34		
Gender				
Male	41	30	1.09 (0.48-2.45)	0.82
Female	20	16		
Education				
Literate	51	29	2.98 (1.21-7.38)	0.01*
Illiterate	10	17		
DM				
Yes	27	29	0.46 (0.21-1.01)	0.06
No	34	17		
HTN				
Yes	22	20	0.73 (0.33-1.60)	0.43
No	39	26		
Hypothyroid				
Yes	2	2	0.74 (0.10-5.50)	0.77
No	59	44		
Asthma				
Yes	5	2	1.96 (0.36-10.61)	0.42
No	56	44		
Duration of hospital stay in days				
≤10	17	10	1.39 (0.56-3.41)	0.47
≥11	44	36		
Duration of ICU Stay in days				
≤10	42	26	1.70 (0.76-3.76)	0.19
≥11	19	20		

Table 6: Factors associated with usual activities component of EQ-5D-5L

*Statistically significant

Table 7: Comparison of EQ-5D-5L domains

	Mobility	Self-care	Usual activities	Pain/discomfort	Anxiety/depression
Present study	76.6%	67.2%	57%	69.1%	73.8%
Fernandez et al.[29]	13.3%	13.3%	51.1%	31.1%	37.8%
Azizi et al.[30]	87%	84%	89%	91%	95%

great psychosocial turmoil on the patients who have suffered and endured the disease. This study observed that COVID-19 patients who were admitted with co-morbidities had a significantly reduced quality of life after discharge from the hospital. This study provided information on the impact of COVID-19 on the HRQoL for COVID-19 ICU survivors. These findings may help healthcare professionals and decision-makers to better understand the consequences of COVID-19 on the HRQoL and therefore gear towards post-COVID-19 care and provide opportunities to apply tailored interventions for COVID-19 survivors especially vulnerable patients who present other risk factors that can better manage the post-COVID-19 impact and restore a good QoL. The strength of the study is for calculating EQ-5D-5L utility scores Indian data set values were used.

Limitations of the study

A decrease in quality of life may not be appropriate as pre-Covid QOL has not been calculated.

Conflicts of interest

There are no conflicts of interest.

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