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ORIGINAL ARTICLE

# Assessing Health-Related Quality of Life and Inducing Factors in COVID-19 Cases at KasrAlainy Teaching Hospital, Egypt

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***Key words:***
***Health-related quality of life (HRQoL), EQ-5D, COVID-19***

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## ABSTRACT

***Background:*** *It is well known that COVID-19 is reported to cause various symptoms and extended illness in older and younger than middle age people with or without pre-existing medical issues. The effects of a disease extend beyond clinical outcomes like mortality and morbidity to subjective measures of life quality (HRQoL), called health-related quality of life. No study has examined the HRQoL of Covid-19 patients in Egypt.* ***Objectives:*** *to establish a quantitative health profile for cases categorized by case severity, treatment protocol and presence of different comorbidities, to compare profiles of COVID-19 recovered cases with a typical individual of the community in a corresponding age and/or sex group using population reference scores and to estimate the burden of COVID-19 on recovered cases.* ***Methodology:*** *This is a cross-sectional research examined each COVID-19-positive case recorded into Kasr Alainy teaching hospital and discharged from July7th, 2020 till the end of March 2021. An anonymous socio-demographic questionnaire was created and completed using patient electronic medical information and the European Quality of Life 5 Dimensions 3 Level Version ( EQ-5D-3L) tool to evaluate health-related quality of life. Arabic version for Egypt for telephone administration was requested at registration@euroqol.org. A professional phone interviewer completed it.* ***Results:*** *In our study, 477 patients were participated. The greatest age group was 35-44 (27.5%), and hypertension (13.4%) was the most common chronic disease. Most patients (76.5%) had mild disease. Age, sex, hypertension/heart disease, and severity were markedly linked to EQ-5D-3L score (P-value<0.001). Young individuals (<18), females, those without HTN/heart disease, and mild cases had the highest mean score, while older individuals (65-73), males, and severe cases had the lowest mean score.* ***Conclusion:*** *COVID-19 significantly affects patient HRQoL, especially hospitalized patients. The study highlights how crucial patient perspectives can determine the effectiveness of interventions and treatments. EQ-5D-3L can help healthcare providers assess COVID-19 patients' HRQoL and suggest areas where they may require further support.*

## INTRODUCTION

The infectious disease known as Coronavirus disease (Covid-19) is resulted from virus named SAR-CoV-2[1]. The World Health Organization (WHO) officially set Covid-19 to be a pandemic on the 11[th] of March 2020[2]. Medical practitioners, governmental bodies, and public health specialists are engaging in collaborative efforts with esteemed health institutions, including the World Health Organization (WHO), to augment their comprehension of the virus and its impacts. The objective is to offer prompt advice and recommendations for the management and mitigation of the transmission and consequences of the virus. This endeavor entails the expansion of scientific understanding and the monitoring of the virus's propagation and ramifications[3].

It is commonly acknowledged that Covid-19 has the potential to manifest a wide array of symptoms[4]. Extended periods of illness and enduring symptoms can manifest in not only older individuals or those with pre-existing medical disorders, but even in younger persons and those without significant underlying health issues[5]. The coronavirus has the capacity to induce respiratory distress syndrome and interstitial pneumonia, both of which possess the capability to precipitate multi-organ

failure[6]. The virus has the potential to influence different organs and body systems, including but not limited to the heart, lungs, brain, nervous system, mental health, musculoskeletal system, and energy levels. This phenomenon can give rise to a variety of symptoms, including feelings of exhaustion and physical discomfort[7]. Individuals who have successfully recuperated from the viral infection may continue to exhibit enduring symptoms, including hypoxia, dyspnea, and diminished functional capacity[8,9].

Based on recent research, it has been observed that certain persons who become infected with COVID-19 may face medical difficulties. Furthermore, a notable proportion of patients, approximately 24%, may persistently exhibit symptoms of the disease even beyond a three-month period following the initial manifestation of the sickness[7,10]. As a result of the reasons outlined above, it is plausible that COVID-19 could have adverse effects on the health-related quality of life (HRQoL) of those who have contracted the virus, both in the immediate and extended periods.

The impact of a disease is not solely confined to its clinical manifestations, such as death rates and illness rates, but also include subjective assessments of well-being referred to as (HRQoL)[11]. The idea of health-related quality of life (HRQoL) is comprehensive and incorporates multiple dimensions that pertain to an individual's physical, social, emotional, and mental well-being[12]. There exists a range of assessment instruments that may be utilized to evaluate (HRQoL), encompassing both general and disease-specific alternatives. Commonly employed for assessing the multifaceted dimensions of health and well-being across various groups are generic methods for measuring (HRQoL), such the SF-36 (36-item Short-Form Health Survey) and EQ-5D (Euro-Qol-5 Dimension)[13]. The St. George Respiratory Questionnaire (SGRQ) and the Clinical COPD Questionnaire (CCQ) are two illness-specific tools used to evaluate quality of life in connection to lung disease[14]. These questionnaires have been employed in the evaluation of health-related quality of life (HRQoL) in persons affected by Covid-19[9,15].

To date, no research on the impact of Covid-19 on the HRQoL of patients with Covid-19 (verified or suspected) has been reported in Egypt. Furthermore, there is a limited understanding regarding the impacts of Covid-19 on the (HRQoL) among individuals with Acute Covid (symptoms that appear within four weeks) and Long Covid (symptoms that appear more than four weeks from the first sign of disease). Hence, the aims of this research endeavor are to produce a comprehensive quantitative assessment of the health status of individuals classified according to the severity of their COVID-19 cases, the treatment protocols employed, and the existence of various comorbidities. Additionally, this study seeks to determine utility scores for the COVID-19 population by comparing them to utility profiles observed in other nations.

## METHODOLOGY

**Study design**:

A cross-sectional study of COVID-19 cases that were discharged from July7th, 2020 till the end of March 2021,at one isolation hospital in Cairo City, Egypt.

**Sample size and technique:**

All COVID-19 cases that were diagnosed as COVID-19 positive cases, admitted to Kasr Alainy teaching hospital and discharged within the specified periods were included in the study.

**Study population and setting:**

The study was performed at Kasr Alainy teaching hospital (as an isolation center for COVID-19 positive cases).

1. **Inclusion criteria**:

All COVID-19 cases diagnosed as COVID-19 positive, admitted to Kasr Alainy teaching hospital and discharged before 7$^{th}$ July 2020 (eligible cases should be discharged ≥ 3 weeks). COVID-19 diagnosis was depending on WHO criteria mentioned at "Global Surveillance for human infection with coronavirus disease (COVID-19)"[16]. Further laboratory testing confirmed that each patient had SARS-CoV-2. The WHO classified SARS-CoV-2 infected cases into four clinical categories: mild, moderate, severe, and critical. When COVID-19 illness was detected, clinical care of severe acute respiratory infection (SARI) was implemented[17]. All COVID-19 patients who agreed to take part in the research and provided verbal informed consent, were included in the study.

2. **Exclusion criteria**

All COVID-19 cases that were diagnosed as COVID-19 positive, admitted to Kasr Alainy Teaching Hospital and discharged after 7th July 2020/or still hospitalized on December 2020. All COVID-19 cases that refused to participate in the research.

**Data collection tools**

1- An anonymous questionnaire was designed including the following sections:
**Socio-demographic data**: age group, gender, any chronic diseases e.g. hypertension, diabetes, COPD, renal affectionless. It was be completed through the electronic medical reports of the patients.

2- The EQ-5D-3L tool[18]: for assessing Health related quality of life was applied. The five aspects that constitute this descriptive system are motility, self-care, routine activities, pain/discomfort, and anxiety/depression. There are three degrees for every aspect: no issues, moderate issues, and severe issues. By selecting the most relevant answer in every one of the five categories, the individual is prompted to describe the condition of his or her

health. The level chosen for that aspect is expressed as a 1-digit number as a consequence of this selection. A five-digit number that represents the patient's state of health may be created by adding the digits for the five aspects. The EQ-5D-3L is translated into over 170 languages. The Arabic version for Egypt (the language used in the present study), tailored for telephone administration was requested via registration @euroqol.org (the official website of Euro-Qol Registration). It was completed by a trained interviewer via phone call.

The EQ VAS uses a vertical visual analogue scale for recording the patient's rating of their health, with the endpoints designated as "best imaginable health state" and "worst imaginable health state." Utilizing the visual analogue score (VAS), a patient's subjective assessment of their health result can be quantified.

**Data analysis and management:**

- A health profile was generated by case severity and treatment protocol (whether the patients was hospitalized or not). Summary statistics were derived, involving number of cases and proportions of categorical responses for the 5 EQ-5D aspects.
- Each person's profiles of health were utilized to produce a health utility index score via a value set and reference unique to **Malaysia**[19] (as no reference values for Egypt are present, Malaysia is the country that most closely approximates Egypt that used (visual analogue score (VAS) not time trade-off (TTO). For both case severity and the therapy regimen, the following ratings were given: mean, standard deviation (SD), minimum, median, and maximum.
- The EQ VAS scores mean, SD, minimum, median, and maximum were calculated by case severity and treatment protocol.
- o The information was coded and exported onto an Excel 365 sheet. Data analysis was conducted using R-studio and the statistical package for social science, SPSS version 23 (SPSS Inc., USA). For the quantitative data, simple descriptive statistics were employed, whereas frequencies were used for the qualitative data. Testing for variations in the quantitative data distributions across subgroups of patients was performed using the One Way ANOVA test and the Independent Sample t-test. In order to identify the variables connected to the health utility index and EQVAS scores, linear regression analysis was performed. A p-value level of less than 0.05 will be regarded significant.
- EQ5D package in R studio was utilized to assess the health utility index score utilizing countries full profile in addition to the Level Frequency & sum Score for an EQ-5D profile (LFS & LSS)[20].

**Ethical consideration:**

Prior the survey began, the participants were given an explanation of the study's goals and were given the option to decide whether to participate or reject. Oral agreement was obtained from those who agreed to take part, and those who declined were not included in the study outcomes. Based on the Helsinki Declaration, strict secrecy concerning participants' personal information was maintained during data input, collecting, and analysis. This was made possible by the anonymous nature of the questionnaire.

## RESULTS

A total sample of 477 cases was involved in our work. The largest patients 'age group was 35-44 (27.5%), followed closely by those aged 25-34 (25.2%). Regarding the profession of health care providers, the majority (62.5%) of participants were non-medical personnel **(Table 1)**. Participants suffering from Hypertension constituted (13.4%) among the study participants. **(Table 2)**. Regarding COVID-19 disease severity, most of patients (76.5%) had a mild form of the disease, thus, hospitalization rate for the participants was only, (18.4%). **(Table 3)**. The EQ VAS measure had a mean of 93 ±11**(Table 4)**. Concerning the association between the demographic characteristics and EQ-5D-3L among the study participants, age and female sex were recorded to be significantly associated with EQ-5D-3L measure (P-value<0.001), with the younger participants (<18) and females, having the maximal mean score of 97.78±6.66 and 91.22 ±12.36 respectively. Additionally, Hypertension and heart disease were also significantly associated with EQ-5D-3L measure(P-value<0.001), with individuals with these conditions having lower mean scores of 87.97±14.57 and 78.33±18.05 respectively compared to those without these conditions. **(Table 5)**. Disease severity was also significantly associated with utility index measure, with individuals with mild disease having a higher mean score of 0.96±0.09 compared to those with moderate 0.92±0.13 or severe disease 0.90±0.08 **(Table 6)**. A multiple regression was run to predict the effect of several demographic and disease factors on the EQVAS score. Only age, gender, heart disease and disease severity, were found to be statistically significantly predicting EQVAS, $F$ (12, 476) = 9.880, $p$ < .0005, $R^2$ = 0.204. All the above 4 variables added statistically significantly to the prediction, $p$ < .05 **(Table 7)**. A multiple regression was run to predict **health utility index** from the same demographic and disease factors. Only age, gender, heart disease and disease severity statistically significantly predicted **health utility index**, $F$ (12, 474) = 7.866, $p$ < .0005, $R^2$ = 0.170. Each of these four factors contributed statistically substantially (p <.05) to the prediction. **(Table 8)**.

**Table 1: Demographic characteristics of the study participants:**

| | | N (477) | % (100) |
|---|---|---|---|
| **Age** | < 18 | 9 | 1.9% |
| | 18-24 | 56 | 11.7% |
| | 25-34 | 120 | 25.2% |
| | 35-44 | 131 | 27.5% |
| | 45-54 | 101 | 21.2% |
| | 55-64 | 49 | 10.3% |
| | 65-73 | 11 | 2.3% |
| **Gender** | Female | 260 | 54.5% |
| | Male | 217 | 45.5% |
| **Profession** | Medical personnel | 179 | 37.5% |
| | Non-medical | 298 | 62.5% |

**Table 2: Disease and medication status of the study participants:**

| | N (477) | % (100) |
|---|---|---|
| **Diabetes** | 48 | 10.1% |
| **Hypertension** | 64 | 13.4% |
| **Heart disease** | 21 | 4.4% |
| **Chronic liver disease** | 7 | 1.5% |
| **Chronic chest disease** | 19 | 4.0% |
| **Other chronic condition** | 21 | 4.4% |
| **Medications** | 83 | 17.4% |

**Table 3: Case severity among the study participants:**

| | | % (100) |
|---|---|---|
| **Disease severity** | Mild | 76.5% |
| | Moderate | 21.4% |
| | Severe | 2.1% |
| **Hospitalized** | Yes | 18.4% |
| | No | 81.6% |

**Table 4: Statistical parameters of the EQ-5D-3L among the study participants:**

| | Mean | Median | Mini. | Maxi. | Standard Deviation | Percentile 25 | Percentile 75 |
|---|---|---|---|---|---|---|---|
| **MO** | 1 | 1 | 1 | 2 | 0 | 1 | 1 |
| **SC** | 1 | 1 | 1 | 2 | 0 | 1 | 1 |
| **UA** | 1 | 1 | 1 | 3 | 0 | 1 | 1 |
| **PD** | 1 | 1 | 1 | 3 | 0 | 1 | 1 |
| **AD** | 1 | 1 | 1 | 3 | 0 | 1 | 1 |
| **EQ VAS** | 93 | 100 | 50 | 100 | 11 | 90 | 100 |
| **Index** | .955 | 1.000 | .370 | 1.000 | .105 | 1.000 | 1.000 |
| **LSS** | 5 | 5 | 5 | 12 | 1 | 5 | 5 |
| **LFS** | 461 | 500 | 32 | 500 | 96 | 500 | 500 |

Mobility (MO), Self-care (SC), Usual activities (UA), Pain & discomfort(PD), Anxiety & depression (AD)., EQ-5D is a standardized measure of health-related quality of life developed by the EuroQol Group. EQ **visual analogue scale** (EQ-VAS).The Level Frequency Score (LFS), The Level Sum Score (LSS).

**Table 5: Association between the enlisted factors and EQ-VAS score among the study participants:**

| | | Mean +/-SD | 95% Confidence Interval for Mean | Range | P value |
|---|---|---|---|---|---|
| **Age** | < 18 | 97.78 ± 6.667 | 92.65- 102.90 | (80-100) | **<0.001*** |
| | 18-24 | 96.07±8.671 | 93.75- 98.39 | (70-100) | |
| | 25-34 | 94.24±9.944 | 92.44- 96.04 | (50-100) | |
| | 35-44 | 93.61±11.061 | 91.70- 95.52 | (50-100) | |
| | 45-54 | 92.84± 10.4 | 90.79- 94.90 | (60-100) | |
| | 55-64 | 91.63± 10.124 | 88.72- 94.54 | (65-100) | |
| | 65-73 | 76.36±19.117 | 63.52- 89.21 | (50-100) | |
| **Sex** | Female | 91.22±12.365 | 89.71- 92.73 | (50-100) | **<0.001*** |
| | Male | 95.95±7.867 | 94.90- 97.00 | (60-100) | |
| **DM** | Yes | 90.54±11.915 | 87.08- 94.00 | (50-100) | 0.056 |
| | No | 93.69±10.646 | 92.68- 94.70 | (50-100) | |
| **HTN** | Yes | 87.97±14.577 | 84.33- 91.61 | (50-100) | **<0.001*** |
| | No | 94.21±9.861 | 93.26- 95.16 | (50-100) | |
| **Heart disease** | Yes | 78.33±18.051 | 70.12- 86.55 | (50-100) | **<0.001*** |
| | No | 94.07±9.848 | 93.16- 94.97 | (50-100) | |
| **Liver disease** | Yes | 89.71±12.338 | 78.30- 101.13 | (70-100) | 0.367 |
| | No | 93.43±10.790 | 92.45- 94.41 | (50-100) | |
| **Chest disease** | Yes | 89.11±8.894 | 84.82- 93.39 | (70-100) | 0.079 |
| | No | 93.55± 10.85 | 92.55- 94.55 | (50-100) | |
| **Other chronic diseases** | Yes | 88.81± 16.272 | 81.40- 96.22 | (50-100) | **0.048*** |
| | No | 93.58 ± 10.468 | 92.62- 94.55 | (50-100) | |
| **Medications** | Yes | 90.48±12.987 | 87.65- 93.32 | (50-100) | **0.007*** |
| | No | 93.98±10.206 | 92.97- 94.99 | (50-100) | |
| **Severity** | Mild | 94.67±9.934 | 93.65- 95.69 | (50-100) | **<0.001*** |
| | Moderate | 89.20±12.68 | 86.71- 91.69 | (50-100) | |
| | Severe | 88.70±9.615 | 81.82- 95.58 | (70-100) | |
| **Medical or not** | Medical | 92.27±11.684 | 90.5- 93.99 | (50-100) | 0.084 |
| | Non-medical | 94.04±10.210 | 92.87- 95.20 | (50-100) | |
| **Hospitalization** | Yes | 92.11±11.022 | 89.78- 94.45 | (50-100) | 0.226 |
| | No | 93.66±10.754 | 92.59- 94.73 | (50-100) | |

**Table 6: Association between the enlisted factors and health utility index among the study participants:**

| | | Mean±SD | 95% Confidence Interval for Mean | | Range | P value |
|---|---|---|---|---|---|---|
| | | | Lower Bound | Upper Bound | | |
| **Age** | < 18 | 1.00±0.0 | 1.0-1.0 | | 1.0-1.0 | **<0.001*** |
| | 18-24 | .98966±.046 | .97716-1.00217 | | .715-1.0 | |
| | 25-34 | .96497±.096 | .94744-.98251 | | .472-1.0 | |
| | 35-44 | .95982±093 | .94363-.97602 | | .564-1.0 | |
| | 45-54 | .94687±0.11 | .92491-.96884 | | .370-1.0 | |
| | 55-64 | .92556±0.12 | .88942-.96170 | | .645-1.0 | |
| | 65-73 | .79236±0.20 | .65317-.93156 | | .379-1.0 | |
| **Sex** | Female | .94090±0.12 | .92609-.95572 | | .370-1.0 | **0.001*** |
| | Male | .97271±.076 | .96237-.98304 | | .564-1.0 | |
| **DM** | Yes | .91427±.14 | .87229-.95625 | | .379-1.0 | **0.004*** |
| | No | .95991±.098 | .95055-.96927 | | .370-1.0 | |
| **HTN** | Yes | .89392±015 | .85405-.93379 | | .370-1.0 | **<0.001*** |
| | No | .96486±0.089 | .95614-.97357 | | .472-1.0 | |
| **Heart disease** | Yes | .81343 ± 0.19 | .72507-.90178 | | .379-1.0 | **<0.001*** |
| | No | .96186 ±0.093991 | .95319-.97053 | | .370-1.0 | |
| **Liver disease** | Yes | .93971± .011 | .83305-1.04637 | | .699-1.0 | 0.692 |
| | No | .95553± 0.10 | .94602-.96504 | | .370-1.0 | |
| **Chest disease** | Yes | .97042±0.059 | .94160-.99924 | | .826-1.0 | 0.521 |
| | No | .95467±.0106 | .94490-.96444 | | .370-1.0 | |
| **Other chronic disease** | Yes | .92257±0.177 | .84184-1.00331 | | .370-1.0 | 0.143 |
| | No | .95681±.0100 | .94757-.96605 | | .379-1.0 | |
| **Medications** | Yes | .91828 ±0144 | .88657-.94999 | | .370-1.0 | **<0.001*** |
| | No | .96302 ±0.092 | .95382-.97222 | | .379-1.0 | |
| **Severity** | Mild | .96445±0 094 | .95466-.97423 | | .370-1.0 | **0.002*** |
| | Moderate | .92712±0. 13 | .90119-.95305 | | .379-1.0 | |
| | Severe | .90700 ±0 .085 | .84573-.96827 | | .796-1.0 | |
| **Medical or not** | Medical | .95219±0.11 | .93587-.96851 | | .370-1.0 | 0.617 |
| | Non-medical | .95716±0.10 | .94559-.96873 | | .379-1.0 | |
| **Hospitalization** | Yes | .93393±.011 | .91004-.95783 | | .379-1.0 | **0.034*** |
| | No | .96016±0.010 | .94993-.97038 | | .370-1.0 | |

**Table 7: Multiple linear regression model predicting EQ-VAS score:**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | P-Value | 95.0% Confidence Interval for B | |
|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | Lower Bound | Upper Bound |
| 1 | **(Constant)** | 46.982 | 12.512 | | **.000*** | 22.394 | 71.569 |
| | **Age** | -.903 | .396 | -.110 | **.023*** | -1.682 | -.124 |
| | **Gender** | 4.760 | .941 | .220 | **.000*** | 2.910 | 6.610 |
| | **Diabetes** | .063 | 1.711 | .002 | .971 | -3.299 | 3.425 |
| | **Hypertension** | 1.716 | 1.666 | .054 | .304 | -1.558 | 4.990 |
| | **Heart disease** | 14.538 | 2.385 | .276 | **.000*** | 9.851 | 19.226 |
| | **Chronic liver disease** | 2.738 | 3.762 | .030 | .467 | -4.656 | 10.131 |
| | **Chronic chest disease** | 3.032 | 2.384 | .055 | .204 | -1.654 | 7.717 |
| | **Other chronic condition** | 2.607 | 2.395 | .050 | .277 | -2.100 | 7.314 |
| | **Medications** | -2.048 | 1.613 | -.072 | .205 | -5.218 | 1.122 |
| | **Disease severity** | -3.623 | .994 | -.162 | **.000*** | -5.577 | -1.669 |
| | **Medical or not** | 1.360 | .970 | .061 | .161 | -.545 | 3.265 |
| | **Hospitalization** | .480 | 1.194 | .017 | .688 | -1.866 | 2.827 |

**Table 8: Multiple linear regression model predicting health utility index:**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | P value | 95.0% Confidence Interval for B | |
|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | Lower Bound | Upper Bound |
| 1 | **(Constant)** | .673 | .124 | | **.000*** | .428 | .917 |
| | **Age** | -.011 | .004 | -.134 | **.007*** | -.018 | -.003 |
| | **Gender** | .038 | .009 | .180 | **.000*** | .019 | .056 |
| | **Diabetes** | .006 | .017 | .016 | .740 | -.028 | .039 |
| | **Hypertension** | .022 | .017 | .073 | .177 | -.010 | .055 |
| | **Heart disease** | .119 | .024 | .233 | **.000*** | .072 | .165 |
| | **Chronic liver disease** | .006 | .037 | .007 | .863 | -.067 | .080 |
| | **Chronic chest disease** | -.030 | .024 | -.057 | .197 | -.077 | .016 |
| | **Other chronic condition** | .009 | .024 | .018 | .704 | -.038 | .056 |
| | **Medications** | -.001 | .016 | -.003 | .959 | -.033 | .031 |
| | **Disease severity** | -.019 | .010 | -.090 | .049 | -.039 | .000 |
| | **Medical or not** | .004 | .010 | .020 | .654 | -.015 | .023 |
| | **Hospitalization** | .019 | .012 | .069 | .115 | -.005 | .042 |

## DISCUSSION

The objective of the current work is to evaluate the HRQOL in Egyptian COVID-19 recovered cases utilizing the EQ-5D scale; the mean score for the EQ-5D score and VAS scale were 0.955 ± 0.11 and 93 ± 11, respectively. The outcomes align with research carried out by ping et al., where the participants had a mean EQ-5D index value of 0.949 ± 0.1 and a mean VAS score of 85.52 ± 19.37. On the contrary, our results are inconsistent with research performed by Arab-Zozani et al., where it was revealed that the mean score for EQ-5D-5L in COVID-19 cases was low (0.613 ± 0.01)[21,22]. This variation might be explained by the ceiling impact that could be caused by the instrument's design, for example, if it isn't adequately sensitive to distinguish between different severity levels. The EQ-5D aspects are restricted to three response groups per item, which may result in a ceiling impact. It's also probable that the three response options per aspect prevent it from capturing individual differences. These are just a few of the potential causes of the ceiling impact seen in the EQ-5D-3L descriptive system[23].

Our findings illustrated that age was significantly associated with EQ-5D-3L measure, with younger individuals (<18) having the highest mean score and those aged (65-73) having the lowest mean score. Sex was also significantly associated, with females having a reduced mean score compared to males, who had a higher mean score. These results are in line with research carried out by Arab-Zozani et al., where it was demonstrated that in comparison to younger patients, patients in the older age groups scored worse on HRQoL, which may indicate that older patients are more affected by COVID-19[22]. The study also found that women scored lower on HRQoL than males did. This finding could potentially be attributed to the fact that women in developing nations tend to be less physically active than men[24]. Additionally, in this study conducted by Arab-Zozani et al. [22], if the patient experienced heart failure or was hospitalized, there was a substantial variation in the mean EQ-5D index values which was similar to our study findings where heart disease and hospital admission were also significantly associated with EQ-5D-3L measure, with individuals with these conditions having lower mean scores compared to those without such conditions. Furthermore, in research conducted by Mastrorosa et al., it was discovered that EQ-VAS ratings were lower for patients who had previously been hospitalized, female gender, and the existence of comorbidities during acute COVID-19[22,25].

According to a novel systematic review, female sex, advanced age, co-morbidities, and the onset of severe disease were the most often found variables linked to worse HRQoL[26]. Furthermore, our findings correlate with research by Algahtani et al., which showed that participants with long-term health issues (such as diabetes, heart illness, or hypertension) had substantially lower quality of life rates[27].

In our research, a multiple regression was performed to predict EQ-VAS and health utility index from Age, Sex, Hypertension, Diabetes, Chronic liver disorder, Heart disorder, Chronic chest disorder, Other chronic condition, Medications, Disease severity, Medical or not, Hospitalization. Only age, gender, heart disease, and disease severity statistically significantly predicted EQVAS. Our study findings correspond with the outcome of the logistic regression in research done by Janapareddi et al. that demonstrated the substantial influencers were “age, gender, and heart conditions” on

several HRQoL aspects. Moreover, the regression analysis that was done by Arab-Zozani et al. presented that age has the greatest influence on HRQoL and has the largest marginal effect among demographic parameters[22,28]. It makes sense, given the close connection between patient aging and the rise in issues they experience.

Various everyday activities are covered by general questionnaires, making it easier to compare populations and/or illnesses. Without an additional respiratory-specific, symptom-based quality-of-life evaluation, the general quality-of-life tools may not be adequately sensitive since the EQ-5D lacks symptom-specific components[29].

Recent research has demonstrated that pandemic-specific requirements and limitations, including social distance or lockdown, can affect people's quality of life in terms of their health, even when they are not sick[30]. Future research examining the quality-of-life disparities between patients infected with COVID-19 and those should not consider this factor in large sample sizes [31].

**Recommendations:**

Healthcare providers should consider the patients' perspective when evaluating the effectiveness of interventions and treatments and incorporate patient-reported outcomes, such as HRQoL, into their assessments. The EQ-5D-3L tool can be useful in assessing the HRQoL of COVID-19 cases and help healthcare providers identify areas where patients may need additional support. In addition, future studies should be conducted to compare the HRQoL of COVID-19 cases across different populations and countries to provide an extensive overview of the impact of the virus on HRQoL. Developing disease-specific HRQoL tools that consider the unique symptoms and complications of COVID-19 may provide a more accurate evaluation of HRQoL in COVID-19 cases. Healthcare providers should consider implementing interventions to improve HRQoL in COVID-19 cases, particularly those requiring hospitalization, such as providing psychological support and rehabilitation programs.

## CONCLUSION

This work aimed to assess the effect of COVID-19 on the health-related quality of life (HRQoL) of patients with COVID-19 in Egypt, specifically those admitted to Kasr Alainy teaching hospital. Our findings revealed that patients with COVID-19 had significantly lower HRQoL scores compared to the general population. Older cases, those with comorbidities, and those hospitalized had lower HRQoL scores. The EQ VAS scores were also lower in patients with severe cases and hospitalized patients.

Our outcomes demonstrate the significant effect of COVID-19 on the HRQoL of cases, particularly those who require hospitalization. The study emphasizes the importance of considering the patients' perspective when evaluating the effectiveness of interventions and treatments. The EQ-5D-3L tool can be a valuable asset in assessing the HRQoL of COVID-19 cases and can help healthcare providers identify areas where patients may need additional support.

**Declarations:**

**Consent for publication**: Not applicable

**Availability of data and material:** Data are available upon request

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