

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Everyone's Smart University College of Management
Master of risk management

Impact of COVID19 on Health-Related Quality of Life of Saudis patients Using the EQ-5D-5L in Saudi Arabia

تأثير فيروس كورونا على جودة الحياة في المرضى السعوديين

Student Name: Menyfah Q. Alanazi
Academic ID: 202222006128

Supervision: Dr. Waleed Suliman

Academic year 2022-2023

Content:

SN.	Content	Page Number
1	Cover page	2
2	Table of Content	3
3	Table of Tables	4
4	Table of Figures	5
5	Abstract	6-7
6	Introduction	8-13
7	Materials and Methods	13-16
	Results	16-20
8	Discussion	20-22
9	Limitation	22
10	Recommendations	23
11	Conclusion	23
12	Acknowledgements	23
13	References	24-26

Table of Content:

SN.	Content	Page Number
1	Abstract	6-7
2	Background	
	Introduction	8-9
	Literature Review	10-11
	Research problem	11
	Importance of the research	12
	Objective	12
	Research Hypotheses	13
	Materials and Methods	
	Study Area/Setting	13
	Study Design	14
	Study Subjects	14
	Sample Size	14
	Sampling Technique	14
	Data Collection methods ¹	4-15
	Assessment of HRQoL	16
	Statistical Analysis	16
	Ethical Issues	16
	Results	
	Response rate	16
	Social Demographic Characteristics	16
	Clinical Characteristics	16
	Assessment of HRQoL	17
	Description of Health State (EQ-5D)	17-18
	Evaluation of Health State (EQ-VAS)	18
	Relationship Between HRQoL and Socio-Demographic / clinical Characteristics	18-20
	Discussion	20-22
	Limitations	22
	Conclusion	23
	Recommendation	22
	Acknowledgments	
	Disclosure	
	Bibliographic References	24-26

Table of Tables:

Table Number	Table Name	Page Number
1	Socio-demographic and clinical characteristics of patients	
2	Numbers and proportions reporting levels within EQ-5D dimensions: pre and post treatment	
3	Association between overall health-related quality of life during infection	

Table of Figures:

Figure Number	Figure Name	Page Number
1	Health state during- and post-infection	
2	Health state During- and post-infection by using EuroQ 5dimension 5 levels 5	
3	EQ-5D-5L index of respondent during infection and post	
4	EQ-5D-5L index of respondent during infection	
5	EQ-5D-5L index of respondent post infection	
6	EQ-VAS of respondent during infection and post	

Impact of COVID19 on Health-Related Quality of Life of Saudis patients Using the EQ-5D-5L in Saudi Arabia

Running title: quality of life of patients with COVID19

Menyfah Q. Alanazi and Waleed Seddik

Abstract

Purpose: Coronavirus disease 2019 (COVID-19) is an infectious acute respiratory disease. Currently, there are no data on COVID-19 and quality of life (QoL) in Saudi Arabia. The aim of this study was to evaluate the impact of COVID-19 and related socio-demographic characteristics on health-related quality of life (HRQoL) of Saudis patients using the EuroQol 5-Dimension, 5-Level (EQ-5D-5L) instrument during infection and after recovery from COVID19.

Patients and Methods: This was a cross-sectional questionnaire study conducted in a tertiary hospital over one-month period.

Results: A total of 398 out of 590 patients with a mean age of 34.87 years (SD: 9.57 years; range 19–59 years) completed both the baseline and follow-up questionnaires of the EQ-5D-5L for a response rate of 65.93%. The mean baseline EQ5D5L index was 0.69 ± 0.29 , the worst health state “55555” was -0.205 representing 1.18% of the patients, and the full health state “11111” was 1 corresponding to 30.68% of the patients.

The mean EQ5D5L index after recovery was 0.92 ± 0.14 , the moderate health state “33333” was 0.701 corresponding to 0.26% of the total patients, and the full health state “11111” was 1 corresponding to 53.2% of the patients. The baseline mean

EuroQol Visual Analogue Scale (EQ-VAS) was 63.16 ± 24.92 , 95% CI (60.68 - 65.65), and 87.46 ± 15.31 ., 95% CI (85.44- 88.49) after recovery from COVID19.

The frequency of patients reporting problems in the EQ-5D dimensions of mobility, self-care, usual activities, pain/ discomfort and anxiety/depression decreased following recovery from COVID19 (70.62% to 17.78%; $P < 0.001$), self-care (35.82% to 10.05%; $P < 0.001$), usual activities (59.79% to 23.20%; $P < 0.001$), pain/discomfort (70.36% to 30.15%; $P < 0.0001$), and anxiety/depression (62.11% to 35.31%; $P < 0.001$).

There were statistically significant associations between HRQoL and, chronic diseases, influenza vaccine and herbal supplements (Costus, Curcuma), honey. There were no statistically significant associations between HRQoL and age, gender, ABO type blood group, number of vaccine.

Conclusion: COVID19 has a significant negative impact on the HRQoL of Saudis with a varying effect depending on the socio-demographic characteristics and chronic diseases and other factors.

Keywords: COVID19, EQ-5D-5L, health-related quality of life, utility, post-acute COVID-19

Syndrome

Abbreviation: COVID19; Coronavirus disease 2019, EQ5D5L; EuroQol 5-Dimension, 5-Level, EQ5D3L; EuroQol 5-Dimension, 3-Level, HRQoL; health-related quality of life,

QoL; Quality of live indicator, HUI; Health Utility Index.

1. Introduction

1.1. Background

Coronavirus disease 2019 (COVID-19) is an infectious acute respiratory disease caused by a novel coronavirus, affecting all ages and gender.¹ COVID-19) was first reported in 2019, and has since spread throughout the world causing more than 628,035,553 confirmed cases, including 6,572,800 deaths globally, as of November 2, 2022.^{1,2} Kingdom of Saudi Arabia confirmed the first positive COVID-19 case on March 2, 2020 [2]. As of November 2, 2022, Saudi Arabia have been 822,718 confirmed cases of COVID-19 with 9,409 deaths.³ General Authority for Statistics has been reported the Saudi Arabia's economy decreased by 7% in the second quarter following coronavirus pandemic. The non-government sector and the government sector recorded a negative growth rate of 10.1% and 3.5%, respectively.⁴

Quality of live indicators (QoL) are strong predictors of a patient's general ability to preserve long-term well-being and productivity. Quality of live defines as a multidimensional concept that refers to an "individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, and standards" and is affected by a person's physical health and psychological state.⁷⁻¹³

Health related quality of life (HRQOL) is a generic measure, which combines both the quality (health status) and quantity (life years) of health. Health-related quality of life (HRQOL) refers to the impact of illness and management of diseases on patients' overall life satisfaction.⁷⁻¹³

health-related quality of life (HRQoL) is important for measuring the burden of diseases and assisting physicians and policy makers to improve patient care and policy decisions.

There are many instruments have been implemented to measure the HRQoL such as time trade-off, standard gamble, or rating scales, Health Utility Index (HUI), EuroQol 5-Dimension, 5-Level questionnaire (EQ-5D-5L), EuroQol 5-Dimension, 3-Level questionnaire (EQ-5D-3L) , and the Short Form 6D (SF-6D) ^{8,9}

The EuroQol 5-Dimension, 5-Level questionnaire (EQ-5D-5L) is a generic and preference-based tool to assess HRQOL based on the patient's perspective of their health. It evaluates the HRQOL status by five dimensions with five levels each and a visual analogue scale. Based on the population under study and value sets, an index value (utility value) is valued using standard valuation technology. ⁷

The EQ-5D is a valid and reliable measure in many disease areas and is the most commonly used tool for assessing cost-utility analyses in order to appraise healthcare interventions.^{10–16} Utility scores are used to quantify the severity of a patient's condition and the burden of disease state, allowing for comparisons across a wide range of disease states, individuals, and different management. Utility scores range from 0 to 1 on a scale with high utility (1) indicating a full health outcome, low utility demonstrating a worse health outcome, and zero representing death.

Therefore, it is necessary to know the level of HRQoL of COVID 19 patients and identify factors that result in decreased or impaired HRQoL as this will help policy makers to prioritize funding and implement interventions to improve QoL.

1.2. Literature Review

The majority of research into Covid-19 has focused on epidemiology education, control and prevention disease, Economy, prevalence, transmission, treatment, epidemiology, mortality and morbidity associated with the virus. However, less consideration has been given to its impact on health-related quality of life (HRQoL) of patients with Covid-19.^{4,5}

Literature reviewed was conducted of studies around the world looking at population-based QoL surveys involving adults. The literature reviewed included studies which used the EuroQol 5-Dimension, 5-Level questionnaire (EQ-5D-5L) tools to assess the quality of life in different populations of different countries and different follow-up periods.

PubMed, and Google Scholar were systematically searched for related published articles, and the key words were used: “COVID 19” AND “Quality of life” OR “ health related quality of life” AND “ “COVID 19” OR “COVID 19” AND ” EQ-5D-5L”.

November 3, 2022, In total, 5,856 studies were identified through the search strategy, and 12 studies were selected to assess the quality of life and persistent symptoms in post- recovery COVID-19 patients.

All reviewed studies were observational, and conducted in united kingdom (Haplin et al.,2021), Spain Spain (Taboada M, et al.,2021) , France (Valent et al.,2020), China (Huang C,2021), China (Ping W,et al, 2020), Spain (Moreno-Pérez et al., 2021), USA (Lubetkin EI, et al,2021), India (Barani S, etal, 2021), Vietnam (Vu MQ, 2020), Morocco (Azizi A., et al, 2022) , Iran (Arab-Zozani M,2020). Belgian (Meys, R., et al, 2020).¹¹⁻²²

The aimed of these studies was to assess the QoL among patients with COVID 19. The mean EQ-5D-5L index values ranging from 0.61 to 0.949.

The studies found: the highest EQ-5D-5L index mean value was reported in the China (0. 0.949) , followed by Morocco (0.86) , UK (0.714), Norway (0.690) , Belgium (0.620) and lowest in Iran (0.612). The studies showed that the main demographic and clinical factors that significantly increase the risk of pain/ discomfort and anxiety/ depression in general population were older age, urban area, gender, lower income, epidemic effects , tobacco use, worried about get COVID-19, presence of chronic diseases especially type 1 diabetes, kidney disease and cardiovascular disease. The quality-of-life infected patients who required intensive care unit (ICU) admission have been shown to have a significantly lower quality of life compared with patients in general ward admission. ⁷⁻²²

The main limitation is the most common of the studies had followed up COVID-19 patients who were hospitalized or elderly populations. Hence, more studies on quality-of-life need to be conducted in both younger and outpatient settings. ^{5,6}

1.3. Research problem

Despite the fact that Coronavirus disease 2019 (COVID-19) is a highly infectious disease and public health hazard in the world with clinical and economic impact.¹⁻⁴ Currently, there are limited information available regarding how COVID-19 affect the quality of life (QoL) of outpatients throughout the world. The most of studies focused on QoL of patients who were hospitalized and elderly. ^{5,6}

In Saudi Arabia, no Data is available on the impact of COVID-19 on health-related QoL in Saudis patients.

1.4. Importance of the research

Health-related quality of life (HRQoL) is one of the most important outcome measures for patients, so that this study is necessary to know the level of HRQoL of patients with COVID 19 and identify factors that result in decreased / impaired / improved HRQoL.

1. This is first study will be conducted in Saudi Arabi to describe HRQoL of Saudis patients who will be infected by the Coronavirus disease 2019 (COVID-19) using EuroQol 5-Dimension, 5-Level questionnaire (EQ-5D-5L) tools and visual analogue scale (EQ-VAS).
2. This is first study will be conducted in the world to describe HRQoL of outpatients with COVID19 using (EQ-5D-5L) tools and scale (EQ-VAS) scale during illness and after recovery.
3. This is first study will be conducted in the world to investigate the relationship between HRQoL of outpatients with COVID19 and using herbal medicine, blood group, history of vaccination (Influenzas vaccine, BCG vaccine, and other), special food (honey and others), and obesity
4. This study will provide more evidence for health decision-makers to set up adequate protocols for the management of possible future pandemics.

1.5. Objective

The objective of this study will evaluate the impact of COVID 19 and related socio-demographics, blood group, history of vaccine , socioeconomic, clinical factors, demographic, life style, herbal medicine, social life, health-related behaviors, chronic diseases, special food, obesity on the HRQoL using the EQ-5D-5L instrument in Saudis patients during and after recovery from COVID 19.

1.6. Research Hypotheses

The research question is “the effects of COVID-19 on Saudis HRQoL varied according to demographic factors, blood group, history of vaccine , socioeconomic, clinical factors, life style, herbal medicine, social life, health-related behaviors, chronic diseases, special food, and obesity”.

Based on the previously reviewed literature, the following hypotheses will proposed for this study

1. Null Hypotheses (H0): There is no relationship between HRQoL of COVID 19 Saudis patients and demographic factors, blood group, history of vaccine , socioeconomic, clinical factors, life style, herbal medicine, social life, health-related behaviors, chronic diseases, special food, obesity.
2. Alternative hypothesis (H1): The HRQoL of Saudis patients with COVID 19 will negatively correlate with demographic factors, blood group, history of vaccine , socioeconomic, clinical factors, life style, herbal medicine, social life, health-related behaviors, chronic diseases, special food, and obesity.

2. MATERIALS AND METHODS

2.2. Design/Setting

This was a cross-sectional questionnaire-based study performed in King Abdulaziz Medical City (KAMC) over two -months period, starting from November to December 2022. KAMC is a 1505- bed university affiliated major tertiary care center in Riyadh, Saudi Arabia.

2.2.Study Subjects

The participants of interest were aged 18 to 59 years and who were diagnosed as COVID19, and the coronavirus confirmed with an quantitative real time polymerase chain reaction (*qPCR*).

Participants younger than 18 or older than 59 years excluded, also who admitted to hospital were excluded, the patients who unable to read and write were excluded from the study.

Consecutive non-probability Sample size is a statistical concept that involves determining the number of patients.

2.3.Sample Size

The study conducted in kmc with an approximate population of 5,000,000, a representative sample of the adult population were 384 patients or more at 95% confidence level and margin error within $\pm 5\%$

2.4.Data Collection

The questionnaires for the Saudis patients were demonstrated in Arabic and the statement of confidentiality issues was explained on the cover page. The completion of the questionnaire was considered consent to participate in the study. Each questionnaire was completed by the participants. The questionnaire composed of two parts as follows:

2.4.1. Socio-Demographic Characteristics:

Socio-demographic data including age, medical history, current use of herbal supplements, education status (higher education, middle education, low education), marital status (single, married, other), employment status (employed, unemployed, student), and the patient's monthly income in Saudi Arabian Riyal (SAR). Clinical characteristics: symptoms, duration of

disease. Past medical history: chronic diseases, vaccination, smoking status.

2.4.2. Assessment of HRQoL

The validity and reliability of an Arabic version of the EQ5D-5L questionnaire was determined after obtaining prior approval from the EuroQol Research Foundation.¹⁶

The EQ-5D instrument questionnaire is comprised of two components: a description of health state (EQ-5D descriptive system) and an evaluation of health state (EQ-5D visual analogue scale (EQ-VAS)). The health state description, EuroQol 5-Dimension, 5-Level (EQ-5D-5L) consists of five dimensions: mobility, self-care, usual activities, pain/ discomfort, and anxiety/depression. Each dimension has three levels of severity scale: 1) no problems, 2) slight problem, 3) moderate problems, 4) severe 5) extreme problems and the participants were asked to select the statement that best describes their health status. The responses are combined to produce a five-digit number describing the respondent's health status (ranging from 11111 to 55555): 11111 (having no problems in all dimensions or full health) and 55555 (having extreme problems in all dimensions or worst health). The EQ-5D-5L health states were converted based on the crosswalk methodology to obtain a standardized utility index (UI) score ranging from 0 (representing death) to 1 (representing full health), with negative values representing states worse than death.^{14,17}.

The second part of the instrument is an evaluation of health state, EQ-VAS, which is a visual vertical scale ranging from "0" to "100". The participant records her health status on a vertical VAS ranging from "Best imaginable health state" (100) to "Worst imaginable health state" (0).

2.5. Statistical Analysis

Analyses were performed using SPSS statistical software (version 22; IBM, Armonk, NY, USA). Descriptive statistics such as frequency, percentage, mean $\pm$ SD, or median (range) were used for socio-demographic, illness variables, and problems at each level for each dimension of the EQ5D-5L. Bivariate analysis using Pearson's χ^2 test was used for categorical variables. For all statistical tests, P For all statistical tests, $P < 0.05$ was considered statically significant.

2.6. Ethical Issues

The study was approved by the Institutional Review Board and the Ethical Committee at King Abdullah International Medical Research Center (KAIMRC), King Saud BinAbdulaziz University for Health Sciences, Riyadh (IRB/2666/22). Oral informed consent and completion of the questionnaire were considered consent to participate in the study. Patient confidentiality and privacy of information were secured by the principal investigator.

3. RESULTS

A total of 389 out of 590 Saudis patients were enrolled in to the study and completed both baseline and follow-up questionnaires for a response rate of 65.93%.

3.1. Social Demographic Characteristics

The mean age was 34.87 ± 8.36 , most patients were aged 30–39 years (42.9%) followed by the age groups 19–29 years (29.8%), 40–49 years (20.3%) and then 50–59 years (8%). The healthy respondents represented 44.3% of patients whereas 55.8% of respondents had at least one medical illness. The majority of the patients

had a high level of educational (82.5%) and were employed 67.4% and most of the respondents were married (64.3%), Table 1.

3.2. Clinical Characteristics

The most common medical illnesses were Vitamin D deficiency representing 30.8% of the patients and asthma representing 15.9% of patients, Iron deficiency (anemia) representing 13.9, Cardiovascular / hypertension representing 11.5% and Zinc deficiency was 4.9%. The most common ABO Blood Groups were O positive, A positive, B positive (42.1%, 26%,15.9% , respectively).

The majority of symptoms during infected by COVID 19 were fatigue (66.1%), fever (48%), cough (35.5%), anxiety/ depression 34.4%, pain bone (46%), numbs and itching were (5.4%,4.6%).

The most commonly persistent symptoms were Cough (14.9%), Lose sense of taste (13.6%) , Lose sense of smell (12.3%), Fatigue (9.8%) Hearing problem (2.4%). There were significantly decline in severity and frequency of symptoms post recovery from COVID19 ($P<0.001$)

The use of herbal supplements during the COVID19 occurred in 55% of patients. The most common herbal supplement was Curcuma 28.5% Peppermint 25.7%, Black bean 16.5%, Costus 7.7%, Apiaceae 7.5%, Chamomile 5.1%, Wild thyme 4.6 % and other 9%. Using of honey was 53%, onion 34.7% and garlic 33.2%.

3.3.Assessment of HRQoL

3.3.1. Description of Health State (EQ-5D)

Figure 1 illustrates that there was an improvement in the health state among respondents after recovery. The percentage of respondents that did not have a problem in any dimensions of the EQ-5D (perfect or full health state) increased from (9.54%) to (80.9%), and the patients has problems at least in one dimension decreased from 87.92% to 46.53%. No worst problems were reported after the recovery. The number of respondents that reported having problems in all dimensions of the EQ-5D (worse or extreme health state) decreased from (2.31%) to none of the respondents following recovery.

As shown in figure2, at baseline, the percentage of respondents who reported having no problems in terms of mobility, self-care, usual activities, pain or discomfort and anxiety or depression were 29.38%, 64.18%, 40.21%, 29.64%, and 37.89%, respectively.

The recovery from COVID19 led to a decrease in the percentage of patients reporting some problems in the dimensions of mobility (70.62% to 17.78%; $P < 0.001$), self-care (35.82% to 10.05%; $P < 0.001$), usual activities (59.79% to 23.20%;

$P < 0.001$), pain/discomfort (70.36% to 30.15%; $P < 0.0001$), and anxiety/depression (62.11% to 35.31%; $P < 0.001$), table 2.

As shown in Figure 3, the baseline for the health state ranged from “11111” to 5555. The full health state “11111” was representing 9.54% of the patients and the worst health state “55555” was representing in 2.32% of the patients. After recovery, the health state ranged from “11111” to “45334”. The full health state “11111” was represented in (80.9%), % of patients and no worst health state.

The baseline EQ-5D-5L index ranged from “ -0.205” to “1” with mean 0.69 ± 0.29 . The baseline EQ-5D-5L index for the worst health state “55555” was -0.205 representing 2.57% of the total patients and 1 for the full health state “11111” corresponding to 9.54 % of the total patients.

After recover from COVID19, The EQ-5D-5L index ranged from “ 0.2430 ” to “1” with mean 0.92 ± 0.14

The EQ-5D-5L index for the least health state “45334 ” was 0.2430 representing 0.2 % of the total patients and 1 for the full health state “11111” corresponding to (80.9%), of the total patients.

The EQ-5D-5L index after recovery for the moderate health state “33333” was 0.701 corresponding to 0.26% of the total patients. *As shown in Figure 3,* The baseline EQ-5D-5L index of health states “11111” increased from (9.77% to 53.35%; $P < 0.01$). The improvement significant ($p=.0001$).

3.3.2 Evaluation of Health State (EQ-VAS)

Health was assessed using the EQ-VAS at two times: baseline VAS (first time was during infected by COVID19) and second VAS (after recovery). This assessment showed significant improvement in quality of life ($p=0.0001$), in general, the

respondents tended towards a gain in quality of life after recovery. The baseline mean EQ-VAS was 63.16 ± 24.92 , 95% CI (60.68 - 65.65) and post recovery the mean EQ-VAS was 87.46 ± 15.31 ., 95% CI (85.44- 88.49).

Relationship Between HRQoL and Socio-Demographic / clinical Characteristics

Table 3 presents the association between HRQoL and sociodemographic. clinical characteristics during infection. The baseline frequencies of the moderate to severe health state were significantly higher in females (61%). A significantly higher frequency was also reported among herbal supplement users compared to those who did not receive herbal supplements ($P = 0.05$).

4. DISCUSSION

This is first study conducted in Saudi Arabi to describe HRQoL of Saudis patients who were infected by the Coronavirus disease 2019 (COVID-19) using EuroQol 5-Dimension, 5-Level questionnaire (EQ-5D-5L) tools and visual analogue scale (EQ-VAS) during and post infection. In addition to investigate the relationship between HRQoL of outpatients with COVID19 and using herbal medicine, blood group, history of vaccination (Influenzas vaccine, BCG vaccine, and other), special food (honey and others), and obesity.

In current study, The COVID19 has negatively impact on HRQoL of Saudis patients, the baseline EQ-5D-5L index mean value was 0.69 ± 0.29 . the quality of life of patients significantly improved post recovery from infection, the EQ-5D-5L index mean was 0.92 ± 0.14 . The post EQ-5D-5L index mean value was similar to previous studies which conducted in china (0.949), and more than EQ-5D-5L index mean

value in previous studies which conducted in Morocco (0.86) , UK (0.714), Norway (0.690) , Belgium (0.620).⁽²²⁻²⁵⁾.

In present study, the Visual Analogue Scale (EQ VAS) scores was 87.46 ± 15.31 which was higher than previous study which was ranged 50.7 and 63 which was reported in in Germany and Belgium respectively.^(19,22,24).

The results of the questionnaire provide a descriptive view of the patients' HRQoL and allow for a direct calculation of Health Utility Values (HUVs). HUVs are key variables in economic decision models and are used in cost–utility analyses for the direct calculation of quality-adjusted life years (QALYs) and the costs associated with medical treatment of COVID19^{16,17,25}

The most commonly persistent symptoms were cough, lose sense of taste,/ sense of smell, Fatigue, arthralgia, headache which were in the previous literature reviewed. Also there some symptoms Hearing problem²⁹

In the present study, the honey has positive impact on infected patients. This is result supported by Clinical trials already published which observed the honey has antiviral and Antibacteria effects in addition to antioxidant content have a huge impact on comorbidities associated with infection by SARS-CoV-2.³⁰

This study indicates the QoL is mainly influenced by COVID19 with QoL showing a decrease in the results analysis of EQ-5D and EQ-VAS with gender, employment, chronic disease, The EQ-5D instrument is a tool used to measure general health

status and is a sensitive and valid approach for monitoring changes in QoL and patient outcomes in Saudis with COVID19.

5. LIMITATIONS

The current study has some limitations. First, it was conducted in only the KAMC in Riyadh, which does not represent all hospitals settings; thus, the findings cannot be generalized. Second, two third the participating patients were females, which might produce some bias, and the participants over 50 years of age had a lower response than the other age groups. Third, this was a short cross-sectional study over a one-month period with a response rate of 65 %that did not represent all of the population. Finally, the measurement of health status using the EQ-5D instrument may have resulted in over- or underestimation of QoL of Saudis with COVID19 because the patients self-assessed their quality of health and may have selected a high level.

6. RECOMMENDATION

Multicenter prospective studies are recommended for the accurate measurement of HRQoL of COVID19 among the Saudi population, understand how the herbal supplement and other factors may affect the HRQoL.

Despite the already reported efficacy of honey against different viruses and their complications, further studies are urgently needed to explain the molecular mechanisms of activity against COVID-19 and, most importantly, clinical trials enrolling COVID-19 patients.

7. CONCLUSION

COVID19 have a significant negative impact on Saudis' HRQoL with a varying effect based on socio-demographic characteristics and chronic diseases.

Identifying the health status of Saudis patients with COVID19 and recognizing the factors that are significantly associated with HRQoL could support and help clinicians and health policymakers make effective and efficient strategies for the improvement and monitoring of patient outcomes in the future

8. DISCLOSURE

The authors reports no conflicts of interest in this work.

9. ACKNOWLEDGMENTS

The authors would like to thanks Mr. Naser Al- Mohameed, Dr. Abdu-Rahman Al-Mohemeed special thanks to all faculty members.

10.AUTHOR CONTRIBUTIONS

The authors contributed to the study concept and design, analysis and interpretation of data, drafting and critically revising the article, agreed on the journal to which the article will be submitted, gave final approval of the version to be published, and agreed to be accountable for all aspects of the work.

REFERENCES

1. COVID-19 Coronavirus Pandemic. Worldometer. 2020. Accessed March 20, 2021. <https://www.worldometers.info/coronavirus/#countries>
2. WHO. The World Health. 2022. Accessed November 3, 2022. <https://covid19.who.int/>
3. <https://covid19.moh.gov.sa/>
4. General Authority for Statistics. Population. In: Statistical Yearbook of 2016. Kingdom of Saudi Arabia: General Authority for Statistics; .
5. Poudel AN, Zhu S, Cooper N, Roderick P, Alwan N, Tarrant C, Ziauddeen N, Yao GL. Impact of Covid-19 on health-related quality of life of patients: A structured review. PLoS One. 2021 Oct 28;16(10):e0259164.
6. Malik P, Patel K, Pinto C, Jaiswal R, Tirupathi R, Pillai S, Patel U. Post-acute COVID-19 syndrome (PCS) and health-related quality of life (HRQoL)-A systematic review and meta-analysis. J Med Virol. 2022 Jan;94(1):253-262.
7. TW. The World Health Organization quality of life assessment (WHOQOL): development and general psychometric properties. Soc Sci Med. 1998;46(12):1569–85
8. 16. EuroQol Research foundation. EQ-5D-3L user Guide. Available from: <https://euroqol.org>. Accessed November24, 2020.
9. 9. The EuroQol Group. EuroQol—a new facility for the measurement of health-related quality of life. *Health Policy*. 1990;16:199–208.
10. 10. Cabasés J, In: RR. Introduction In: Szende A, Janssen B, Cabases J, editors. *Self-Reported Population Health: An International Perspective Based on EQ-5D*. Dordrecht: Springer; 2014:1–6.
11. Halpin SJ, Mclvor C, Whyatt G, et al. Postdischarge symptoms and rehabilitation needs in survivors of COVID-19 infection: a cross- sectional evaluation. J Med Virol. 2021;93(2):1013-1022.
12. Barani S, Bhatnagar T, Natarajan M, Gayathri K, Sonekar HB, Sasidharan A, Selvavinayagam TS, Bagepally BS. Health-related quality of life among COVID-19 individuals: A cross-sectional study in Tamil Nadu, India. Clin Epidemiol Glob Health. 2022 Jan-Feb;13:100943.

13. Vu MQ, Tran TTP, Hoang TA, Khuong LQ, Hoang MV. Health-related quality of life of the Vietnamese during the COVID-19 pandemic. *PLoS One*. 2020 Dec 18;15(12):e0244170.
14. .Valent A, Dudoignon E, Ressaire Q, Dépret F, Plaud B. Three-month quality of life in survivors of ARDS due to COVID-19: a preliminary report from a French academic centre. *Anaesth Crit Care Pain Med*. 2020;39(6):740-741.
15. Huang C, Huang L, Wang Y, et al. 6-month consequences of COVID- 19 in patients discharged from hospital: a cohort study. *Lancet*. 2021;397(10270):220-232.
16. Ping W, Zheng J, Niu X, Guo C, Zhang J, Yang H, Shi Y. Evaluation of health-related quality of life using EQ-5D in China during the COVID-19 pandemic. *PLoS One*. 2020 Jun 18;15(6):e0234850.
17. Moreno-Pérez O, Merino E, Leon-Ramirez J-M, et al. Post-acute COVID-19 syndrome. Incidence and risk factors: a Mediterranean cohort study. *J Infect*. 2021;82(3):378-383.
18. Health inequities as measured by the EQ-5D5L during COVID-19: Results from New York in healthy and diseased persons
19. Azizi A, Achak D, Saad E, Hilali A, Nejari C, Khalis M, Youlyouz-Marfak I, Marfak A. Health-Related Quality of Life of Moroccan COVID-19 Survivors: A Case-Control Study. *Int J Environ Res Public Health*. 2022 Jul 20;19(14):8804.
20. Arab-Zozani M, Hashemi F, Safari H, Yousefi M, Ameri H. Health-Related Quality of Life and its Associated Factors in COVID-19 Patients. *Osong Public Health Res Perspect*. 2020 Oct;11(5):296-302.
21. Meys R., Delbressine J.M., Goërtz, Y.M.J., et al. Generic and Respiratory-Specific Quality of Life in Non-Hospitalized Patients with COVID-19. *J. Clin. Med*. 2020, Sep, 3993.
22. Meys, Roy, et al. "Generic and respiratory-specific quality of life in non-hospitalized patients with COVID-19." *Journal of clinical medicine* 9.12 (2020): 3993.
23. Chopra, V., Flanders, S. A., O'Malley, M., Malani, A. N., & Prescott, H. C. (2021). Sixty-day outcomes among patients hospitalized with COVID-19. *Annals of internal medicine*, 174(4), 576-578.

24. Carfi, A., Bernabei, R., & Landi, F. (2020). Gemelli against COVID-19 post-acute care study group. Persistent symptoms in patients after acute COVID-19. *JAMA*, 324(6), 603-605.
25. Alanazi MQ. Evaluation of Health-Related Quality of Life in Women with Community-Acquired Urinary Tract Infections Using the EQ-5D-3L in Saudi Arabia. *Patient Preference Adherence*. 2020 Dec 4;14:2419-2426.
26. Jacobs LG, Gournas Paleoudis E, Lesky-Di Bari, et al. Persistence of symptoms and quality of life at 35 days after hospitalization for COVID-19 infection. *PLoS One*. 2020;15(12):e0243882. 7
27. 10 SPAIN Taboada M, Moreno E, Cariñena A, et al. Quality of life, functional status, and persistent symptoms after intensive care of COVID-19 patients. *Br J Anaesth*. 2021;126(3):e110-e113.
28. 14 UK Halpin SJ, McIvor C, Whyatt G, et al. Postdischarge symptoms and rehabilitation needs in survivors of COVID-19 infection: a cross-sectional evaluation. *J Med Virol*. 2021;93(2):1013-1022.
29. Malik, P., Patel, K., Pinto, C., Jaiswal, R., Tirupathi, R., Pillai, S., & Patel, U. (2022). Post-acute COVID-19 syndrome (PCS) and health-related quality of life (HRQoL)—A systematic review and meta-analysis. *Journal of medical virology*, 94(1), 253-262.
30. Soares, Sónia, et al. "Honey as an Adjuvant in the Treatment of COVID-19 Infection: A Review." *Applied Sciences* 12.15 (2022): 7800

Appendix I: Figures

Figure 1 Health state during- and post-treatment

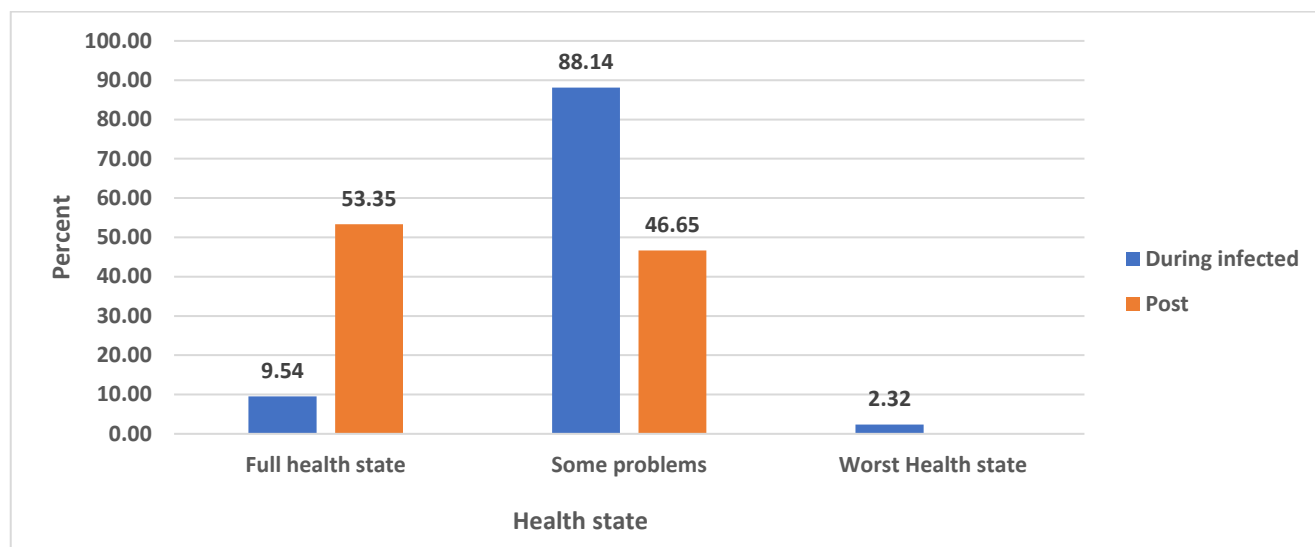


Figure2: Health state During- and post-infection by using EuroQ 5dimension 5 levels 5

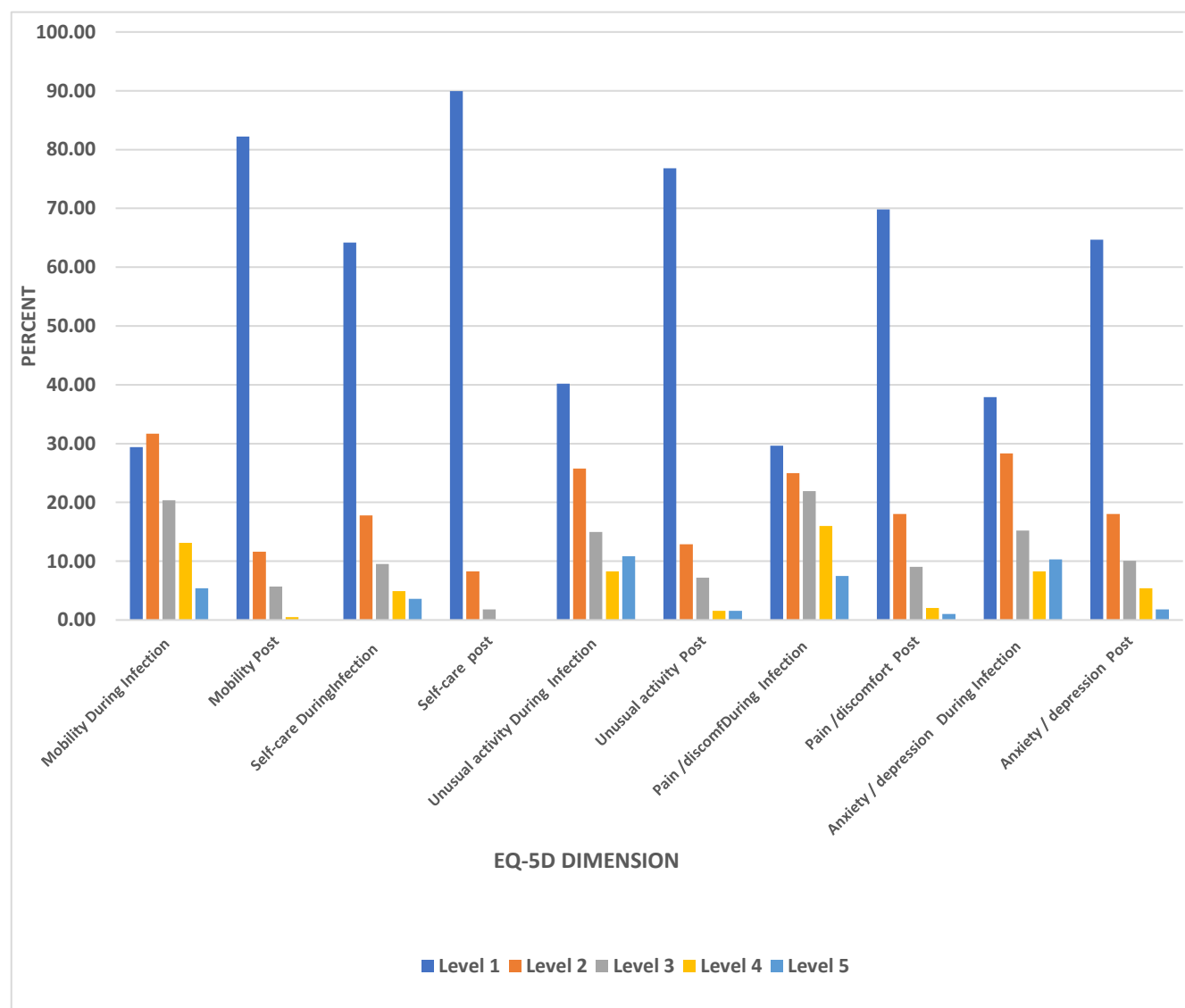


Figure 3: EQ-5D-5L index of respondent during infection and post

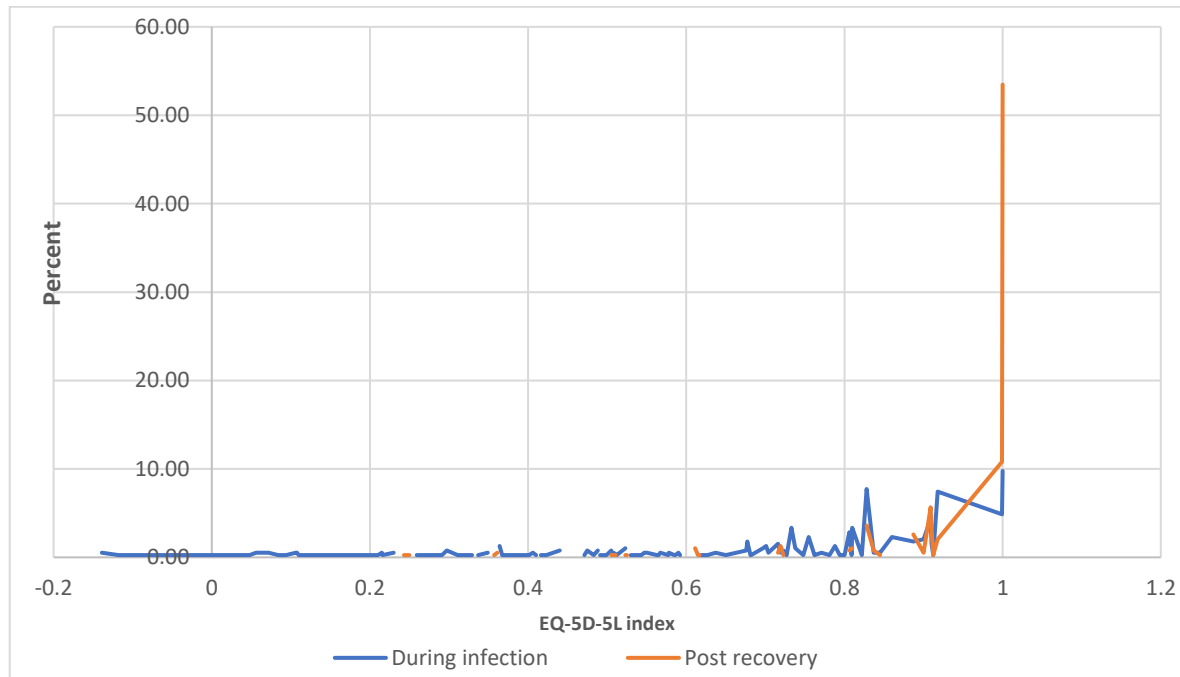


Figure 4: EQ-5D-5L index of respondent during infection

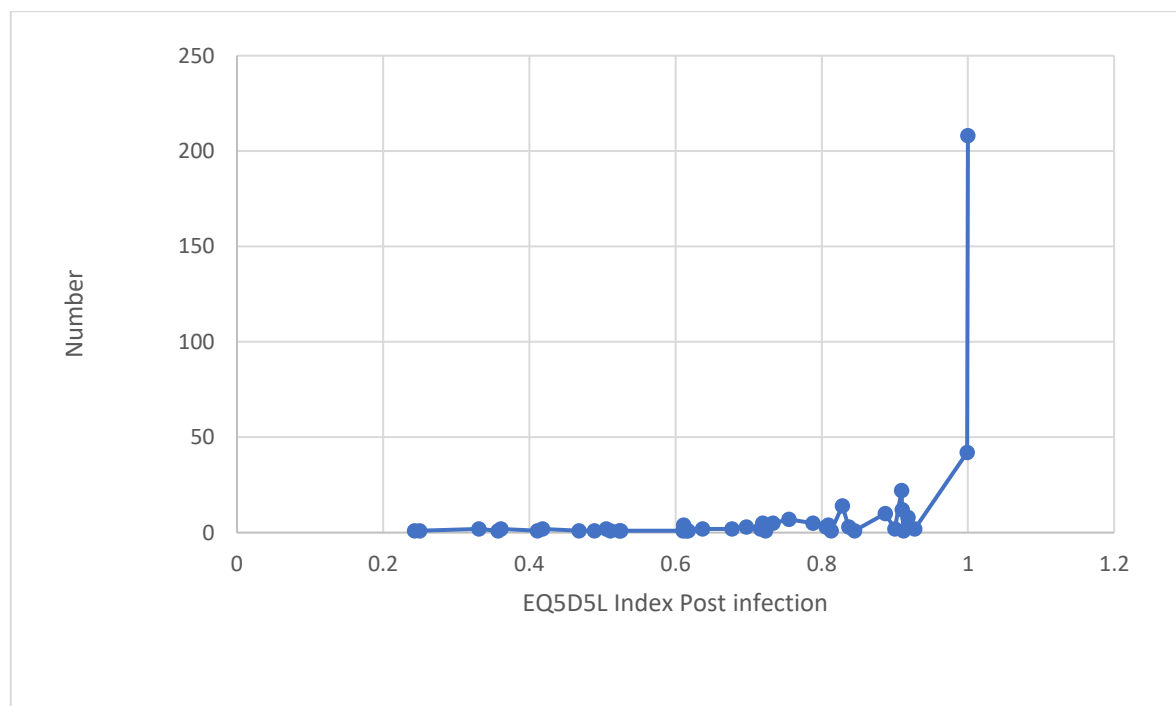


Figure 5: EQ-5D-5L index of respondent post infection

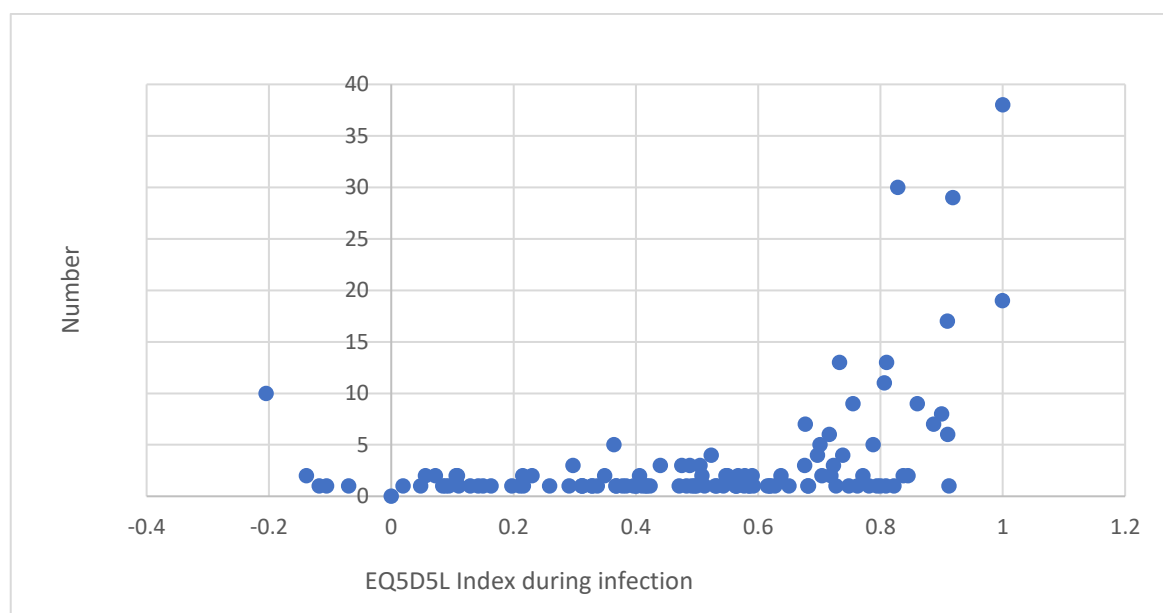
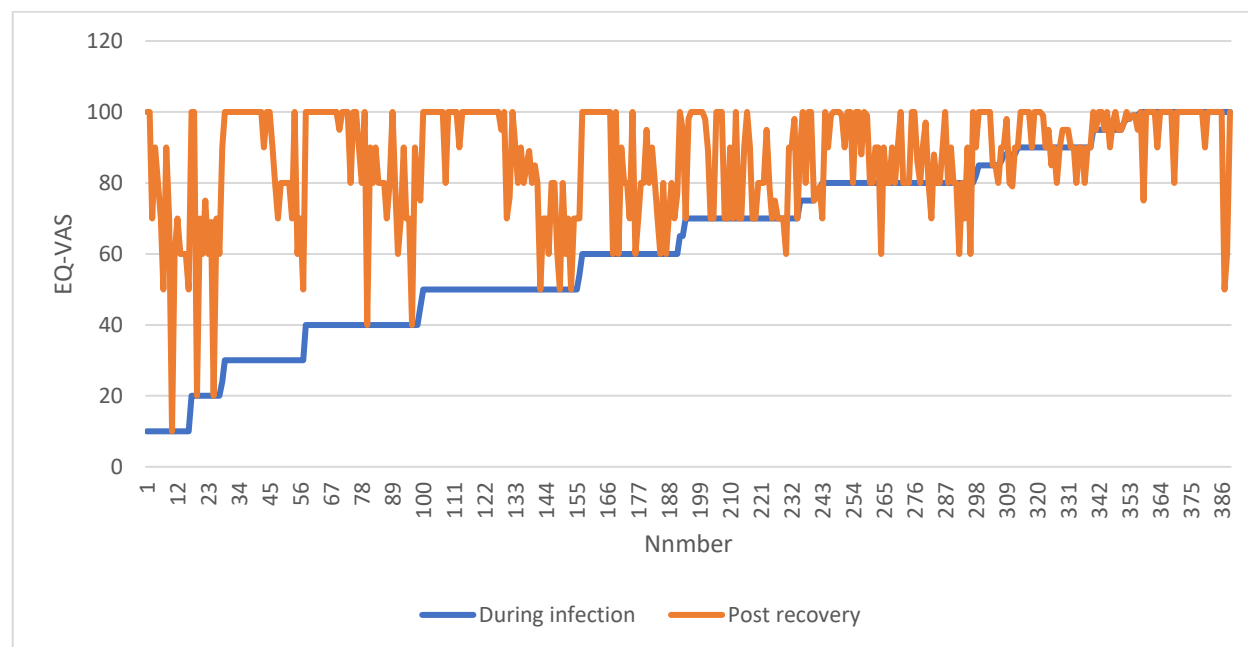


Figure 6 EQ-VAS of respondent during infection and post



Appendix II: Tables

Table 1 Socio-demographic and clinical characteristics of patients

Characteristic	N (%)
Social / Demographic Characteristics	
Gender	
Males	130 (33.4)
Females	259 (66.6)
Age (years)	
Mean $\pm$ SD	34.87 $\pm$ 8.36
Median (Q1-Q3)	34 (29 - 40)
19 – 29	112 (29.8)
30 – 39	167 (42.9)
40 – 49	79 (20.3)
50 – 59	31 (8)
Education, years	
Low education (≤ 9)	12 (3.1)
Middle education (12–15)	56 (14.4)
Higher education (≥ 16)	321 (82.5)
Employment status	
Student	40 (10.3)
Employed	262 (67.4)
Unemployed	87 (22.4)

Marital status	
Single	118 (30.3)
Married	250 (64.3.99)
Other	21 (5.4)
Smoking status	
Yes	66 (17)
No	259 (66.6)
Other	64 (16.5)
Clinical characteristics	
ABO Blood Group	
O Positive	164 (42.1)
A Positive	102 (26.2)
B Positive	62 (15.9)
Other	61 (15.7)
Chronic conditions	
No Chronic conditions	172 (44.3)
yes	217(55.8)
Vitamin D deficiency	120 (30.8)
Asthma	62 (15.9)
Iron deficiency (anemia)	54 (13.9)
Zinc deficiency	19(4.9)
Diabetes mellitus	21(5.4)
Cardiovascular / hypertension	43 (11.50)

Other	18 (4.3)
Number of respiratory infection per 6mon	
1	194 (49.9)
2	104 (26.7)
3	54 (13.9)
Daily sleepy hours	
Less than four hours	23 (5.9)
From 4 to 5 hours	99 (25.4)
From 6 to 7 hours	216 (55.5)
More than hours	51 (13.1)
Symptoms during infection	
Anxiety / Depression	134 (34.4)
Cough,	138 (35.5)
Lose sense of taste	63(16.2)
Lose sense of smell	70(18.3)
Sleeping disturbances	48 (12.3)
Fatigue	257 (66.1)
Dyspnea, or shortness of breath	69 (17.7)
Headache	202(51.9)
Anorexia	144 (37)
Arthralgia	66 (17)
Sinusitis	2 (0.5)

Pain bone	179 (46)
Sore throat	105 (27)
Hearing problem	40 (10.3)
Numbs	21 (5.4)
Fever	187 (48)
Itching	18 (4.6)
Persistent symptoms	
Hoarseness of voice	105 (27)
Anxiety / Depression	70 (17.7)
Cough,	58 (14.9)
Lose sense of taste	53 (13.6)
Lose sense of smell	48(12.3)
Sleeping disturbances	44 (11.15)
Fatigue	39 (9.8)
Dyspnea	28 (7.2)
Headache	23 (5.9)
Arthralgia	25 (6.4)
mental health	8(2.1)
Sinusitis	2 (0.5)
Chest pain,	5 (1.3)
Pain bone	3 (0.8)
Sore throat	23 (6)

Loss appetite	7 (1.8)
Hearing problem	9 (2.4)
Dizziness	10 (2.6)
Itching	2 (0.5)
Vaccination	
Seasonal Influenza Vaccine	147 (37.8)
Bacillus Calmette–Guérin (BCG) Vaccine	288 (74)
Use of herbal supplements	
Yes	214 (55)
Curcuma	111 (28.5)
Wild thyme	18 (4.6)
Black bean	64 (16.5)
Costus	30 (7.7)
Peppermint	100 (25.7)
Apiaceae	29 (7.5)
Chamomile	20 (5.1)
Ginger	31 (8)
Honey	206 (53)
Garlic	129 (33.2)
Onion	135(34.7)

Table 2 Numbers and proportions reporting levels within EQ-5D dimensions: during and post recovery from COVID19

EQ-5D DIMENSION Level	Mobility		P value	Self-care		P value	Unusual activity		P value	Pain /discomfort		P value	Anxiety / depression		P value
	During	Post	0.001	During	Post	0.001	During	Post	0.001	During	Post	0.001	During	Post	0.001
Level I	114 (29.38)	319 (82.22))		249 (64.18)	349 (89.95)		156 (40.21)	298 (76.80)		115 (29.64)	271 (69.8 5)		147 (37.89)	251 (60.69)	
Level II	123 (31.70)	45 (11.60)		69 (17.78)	32 (8.25)		100 (25.77)	50 (12.89)		97 (25.00)	70 (18.0 4)		110 (28.35)	70 (18.04)	
Level III	79 (20.36)	22 (5.67)		37 (9.54)	7 (1.08)		58 (14.95)	28 (7.22)		85 (21.91)	35(9. 02)		59 (15.21)	39 (10.05)	
Level IV	51 (13.14)	2 (0.52)		19 (4.90)	0		32 (8.25)	6 (1.55)		62 (15.98)	8 (2.06)		32 (8.25)	21 (5.41)	

Level V	21 (5.41)	-		14 (3.61)	0		42 (10.82)	6 (1.55)		29 (7.47)	4 (1.03)		40 (10.31)	7 (1.80)	
Total	388 (100)	388 (100)		388 (100)	388 (100)		388 (100)	388 (100)		388 (100)	388 (100)		388 (100)	388 (100)	
Reporting Problems	274 (70.62)	69 (17.78)		139 (35.82)	39 (10.05)		232 (59.79)	90 (23.20)		273 (70.36)	117 (30.1 5)		241 (62.11)	137 (35.31)	

Notes: Level I, no problems; Level II, mild problems; Level III, moderate problems; Level IV, sever problems ;Level V, extreme problems; Total, Results are for those who responded to both the pre- and post-treatment questionnaire; Some problems = levels 2,3 and 4.

Table 3 Association between overall health-related quality of life during infection

Characteristics	Perfect health	Mild to Moderate	Worse	P- value
Gender				0,001
Females	14 (3,6)	238 (61)	7 (1,8)	
Male	23 (3,6)	105 (27)	2 (0.5)	
Age Category				0.152
19 – 29	16 (43.2)	95(27.7)	1 (11.1)	
30 – 39	11(29.7)	152 (44.3)	4 (44.4)	
40 – 49	9 (24.3)	68 (19.8)	2 (22.2)	
50 – 59	1(2.7)	28 (8.2)	2 (22.2)	
Use of herbal supplements	22 (5,7)	185 (47.6)	7 (1.8)	0.05
Curcuma	13 (3,3)	92 (23,7)	6 (1,5)	0.021
Custus	1 (0,3)	28 (7,2)	1 (0.3)	0.461
Peppermint	8 (2,1)	88 (22.6)	3 (0,8)	0.948
Black bean	1 (0.3)	59 (15.2)	4 (1)	0.001
Honey	20 (5.1)	178 (45,9)	8 ()2,1	0.013
Bacillus Calmette–Guérin (BCG) Vaccine	19 (4,9)	260 (66.8)	9 (2,3)	0.000
Seasonal Influenza Vaccine	14 (3,8)	129 (33,2)	4 (1)	0.917

INDEX C : EQ5D5L INDEX

The variables for the 5 dimensions of the EQ-5D-5L descriptive system should be named 'mobility', 'selfcare', 'activity', 'pain', and 'anxiety'.

If they are given different names the syntax code below will not work properly.

The 5 variables should contain the values for the different dimensions in the EQ-5D health profile (i.e. 1, 2, 3, 4 or 5). The variable 'EQindex' contains the values of the EQ-5D-5L index values on the basis of th

IF (mobility=1) disut_mo=0.

IF (mobility=2) disut_mo=0.026.

IF (mobility=3) disut_mo=0.042.

IF (mobility=4) disut_mo=0.139.

IF (mobility=5) disut_mo=0.224.

IF (selfcare=1) disut_sc=0.

IF (selfcare=2) disut_sc=0.050.

IF (selfcare=3) disut_sc=0.056.

IF (selfcare=4) disut_sc=0.169.

IF (selfcare=5) disut_sc=0.260.

IF (activity=1) disut_ua=0.

IF (activity=2) disut_ua=0.036.

IF (activity=3) disut_ua=0.049.

IF (activity=4) disut_ua=0.129.

IF (activity=5) disut_ua=0.209.

IF (pain=1) disut_pd=0.

IF (pain=2) disut_pd=0.057.

IF (pain=3) disut_pd=0.109.

IF (pain=4) disut_pd=0.404.

IF (pain=5) disut_pd=0.612.

IF (anxiety=1) disut_ad=0.

IF (anxiety=2) disut_ad=0.030.

IF (anxiety=3) disut_ad=0.082.

IF (anxiety=4) disut_ad=0.244.

IF (anxiety=5) disut_ad=0.356.

Compute disut_total= disut_mo +disut_sc +disut_ua +disut_pd +disut_ad.

Compute EQindex = 1-disut_total.

execute.

Computing EQ-5D-5L crosswalk index values with SPSS using the Claes value set for German
Version 1.1 (Updated 17/11/2020)

The variables for the 5 dimensions of the EQ-5D-5L descriptive system should be named 'mobility', 'selfcare', 'activity', 'pain', and 'anxiety'. If they are given different names the syntax code below will not work properly. The 5 variables should contain the values for the different dir in the EQ-5D health profile (i.e. 1, 2, 3, 4 or 5). The variable 'EQ5Dindex' contains the values EQ-5D-5L crosswalk index values on the basis of the German set of weights.

SPSS syntax code for the computation of index

*****;

```
IF (mobility=1 & selfcare=1 & activity=1 & pain=1 & anxiety=1) EQ5Dindex = 1.000.
IF (mobility=1 & selfcare=1 & activity=1 & pain=1 & anxiety=2) EQ5Dindex = 0.999.
IF (mobility=1 & selfcare=1 & activity=1 & pain=1 & anxiety=3) EQ5Dindex = 0.999.
IF (mobility=1 & selfcare=1 & activity=1 & pain=1 & anxiety=4) EQ5Dindex = 0.809.
IF (mobility=1 & selfcare=1 & activity=1 & pain=1 & anxiety=5) EQ5Dindex = 0.611.
IF (mobility=1 & selfcare=1 & activity=1 & pain=2 & anxiety=1) EQ5Dindex = 0.910.
IF (mobility=1 & selfcare=1 & activity=1 & pain=2 & anxiety=2) EQ5Dindex = 0.909.
IF (mobility=1 & selfcare=1 & activity=1 & pain=2 & anxiety=3) EQ5Dindex = 0.909.
IF (mobility=1 & selfcare=1 & activity=1 & pain=2 & anxiety=4) EQ5Dindex = 0.719.
IF (mobility=1 & selfcare=1 & activity=1 & pain=2 & anxiety=5) EQ5Dindex = 0.521.
IF (mobility=1 & selfcare=1 & activity=1 & pain=3 & anxiety=1) EQ5Dindex = 0.887.
IF (mobility=1 & selfcare=1 & activity=1 & pain=3 & anxiety=2) EQ5Dindex = 0.887.
IF (mobility=1 & selfcare=1 & activity=1 & pain=3 & anxiety=3) EQ5Dindex = 0.887.
IF (mobility=1 & selfcare=1 & activity=1 & pain=3 & anxiety=4) EQ5Dindex = 0.697.
IF (mobility=1 & selfcare=1 & activity=1 & pain=3 & anxiety=5) EQ5Dindex = 0.499.
IF (mobility=1 & selfcare=1 & activity=1 & pain=4 & anxiety=1) EQ5Dindex = 0.677.
IF (mobility=1 & selfcare=1 & activity=1 & pain=4 & anxiety=2) EQ5Dindex = 0.677.
IF (mobility=1 & selfcare=1 & activity=1 & pain=4 & anxiety=3) EQ5Dindex = 0.677.
IF (mobility=1 & selfcare=1 & activity=1 & pain=4 & anxiety=4) EQ5Dindex = 0.550.
IF (mobility=1 & selfcare=1 & activity=1 & pain=4 & anxiety=5) EQ5Dindex = 0.418.
IF (mobility=1 & selfcare=1 & activity=1 & pain=5 & anxiety=1) EQ5Dindex = 0.361.
IF (mobility=1 & selfcare=1 & activity=1 & pain=5 & anxiety=2) EQ5Dindex = 0.361.
IF (mobility=1 & selfcare=1 & activity=1 & pain=5 & anxiety=3) EQ5Dindex = 0.361.
IF (mobility=1 & selfcare=1 & activity=1 & pain=5 & anxiety=4) EQ5Dindex = 0.329.
IF (mobility=1 & selfcare=1 & activity=1 & pain=5 & anxiety=5) EQ5Dindex = 0.296.
IF (mobility=1 & selfcare=1 & activity=2 & pain=1 & anxiety=1) EQ5Dindex = 0.999.
IF (mobility=1 & selfcare=1 & activity=2 & pain=1 & anxiety=2) EQ5Dindex = 0.999.
IF (mobility=1 & selfcare=1 & activity=2 & pain=1 & anxiety=3) EQ5Dindex = 0.999.
IF (mobility=1 & selfcare=1 & activity=2 & pain=1 & anxiety=4) EQ5Dindex = 0.809.
IF (mobility=1 & selfcare=1 & activity=2 & pain=1 & anxiety=5) EQ5Dindex = 0.611.
IF (mobility=1 & selfcare=1 & activity=2 & pain=2 & anxiety=1) EQ5Dindex = 0.909.
IF (mobility=1 & selfcare=1 & activity=2 & pain=2 & anxiety=2) EQ5Dindex = 0.909.
IF (mobility=1 & selfcare=1 & activity=2 & pain=2 & anxiety=3) EQ5Dindex = 0.909.
```

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

IF (mobility=5 & selfcare=5 & activity=5 & pain=4 & anxiety=1) EQ5Dindex =-0.018.
IF (mobility=5 & selfcare=5 & activity=5 & pain=4 & anxiety=2) EQ5Dindex =-0.018.
IF (mobility=5 & selfcare=5 & activity=5 & pain=4 & anxiety=3) EQ5Dindex =-0.018.
IF (mobility=5 & selfcare=5 & activity=5 & pain=4 & anxiety=4) EQ5Dindex =-0.050.
IF (mobility=5 & selfcare=5 & activity=5 & pain=4 & anxiety=5) EQ5Dindex =-0.083.
IF (mobility=5 & selfcare=5 & activity=5 & pain=5 & anxiety=1) EQ5Dindex =-0.140.
IF (mobility=5 & selfcare=5 & activity=5 & pain=5 & anxiety=2) EQ5Dindex =-0.140.
IF (mobility=5 & selfcare=5 & activity=5 & pain=5 & anxiety=3) EQ5Dindex =-0.140.
IF (mobility=5 & selfcare=5 & activity=5 & pain=5 & anxiety=4) EQ5Dindex =-0.172.
IF (mobility=5 & selfcare=5 & activity=5 & pain=5 & anxiety=5) EQ5Dindex =-0.205.

y

ability',

tensions
of the