

ASSESSMENT OF LIFE QUALITY AND HEALTH PERCEPTION AMONG RECOVERED COVID-19 PATIENTS: MULTIVARIATE ANALYSIS – OWN MATERIAL AND A REVIEW OF PREVIOUS REPORTS ON LIFE QUALITY ASSESSMENT AMONG CONVALESCENTS

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ABSTRACT

Background: The SARS-CoV-2 virus, causing acute respiratory disease, is responsible for the COVID-19 pandemic, which began in early 2020. In addition to symptoms typical of respiratory tract infections, the virus causes a number of non-specific, often long-lasting effects that hinder the daily functioning of individuals. The aim of the study was a subjective assessment of life quality and health perception among recovered COVID-19 patients. **Material and Methods:** The study included 337 subjects who had been infected with SARS-CoV-2 confirmed by a positive RT-PCR test. The study participants were of legal age. The convalescents completed a questionnaire that contained 26 questions about gender, height, body weight, blood type, general and specific symptoms, comorbidities, hospital stay and duration of specific symptoms, the severity of which was assessed on the *Visual Analogue Scale* (VAS). The subjects determined whether the COVID-19 infection influenced their health perception and life quality. **Results:** According to 46% of the respondents, COVID-19 had an impact on their quality of life and health. The chance for patients to notice the negative effects of COVID-19 on their current health status and life quality increased with each subsequent symptom of the disease by 49%, with each day of its occurrence by 3%, and with each VAS point of the severity of all infection symptoms by 30%. **Conclusions:** The study shows that COVID-19 disease affects life quality and overall health perception after recovery. Significant impact of COVID-19 on the quality of life should be a signal to create mental support and rehabilitation programs for convalescents to minimize discomfort and shorten the duration of absenteeism from work. *Med Pr.* 2022;73(6):449–56

Key words: SARS-CoV-2, COVID-19 pandemic, long COVID-19, quality of life, post-COVID-19 syndrome, health perception after COVID-19

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INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic has been ongoing since March 2020. The first cases of infection caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) were reported at the end of 2019 in Wuhan, China [1–3]. SARS-CoV-2 is a ribonucleic acid (RNA) virus belonging to the family

Coronaviridae. It causes acute respiratory disease leading, in severe cases, to the development of acute respiratory distress syndrome [1,4,5].

Owing to multi-centre studies on different continents, a lot of data have been gathered on the characteristics of the disease. There is a lot of information about risk factors, clinical presentation, diagnosis, and treatment of the acute phase of the disease [3,6,7]. However,

there is still a lack of information on the long-term effects of the COVID-19 disease, which may have consequences not only for individuals, but may also affect the functioning of the entire population [4,5,8–12]. The ongoing pandemic poses a great challenge to health care systems and entire societies [2,4]. During successive waves of the coronavirus epidemic, the health care system collapses in many countries, and during lockdowns a significant proportion of people lose their sources of income [9,13].

Researchers are paying more and more attention to the long-term impact of the pandemic on life quality [1,3,4,8,11,13–17]. It is predicted that even a mild form of COVID-19 may have a significant impact on physical and mental health, as well as on cognitive and social functions [17,18].

According to the definition of the World Health Organization (WHO), quality of life (QoL) is a subjective assessment by individuals of their life situation in relation to the culture in which they live, their system of values, goals, expectations, and interests [19–22]. In medicine, the term health related quality of life (HRQoL) is more often used, which, according to Schipper's definition, refers to the functional effect of the disease and its treatment perceived by patients [4,21–23].

There are few studies assessing health perception among recovered COVID-19 patients, especially in a group of non-hospitalized subjects [18]. The aim of the present study was to analyse the subjective assessment of the impact of COVID-19 on life quality and overall health in patients who recovered from SARS-CoV-2 infection.

MATERIAL AND METHODS

A retrospective survey included 337 subjects, who were, *inter alia*, employees of the Bolesław Śmiały Coal Mine in Łaziska, Poland (selected from the entire staff of 1750 employees) and patients of the ENT Clinic in Zabrze and Katowice, Poland, who were treated in the first half of 2021. The criterion for qualifying patients for the study was previous SARS-CoV-2 infection confirmed by a positive polymerase chain reaction test (PCR). In the group of patients, 14 were hospitalized, 13 required passive oxygen therapy, and 2 were treated in the intensive care unit.

All study participants were of legal age (18–86 years). The respondents answered 26 questions with sub-items. The questions concerned the occurrence of symptoms such as: cough, fever $>38^{\circ}\text{C}$, dyspnoea, weakness, gastrointestinal disorders, headache, musculoskeletal pain,

conjunctivitis, movement disorder, runny nose, testicular pain, vertigo/dizziness, hearing impairment, olfactory disorder, taste disturbance, memory impairment. Additionally, the respondents were asked about the presence of comorbidities of the respiratory or cardiovascular system as well as autoimmune and oncological diseases. Moreover, they provided information on height, body weight and blood group. The questionnaire also included questions about the duration of symptoms, hospitalization and stay in the intensive care unit (ICU).

In the case of questions concerning the symptoms, the respondents indicated their severity on the *Visual Analogue Scale* (VAS) in points ranged 0–10, where 0 pts meant no symptoms, and 10 pts – highest severity.

Patients were asked whether, in their opinion, previous COVID-19 infection somehow influenced their current health status and life quality.

The impact on the quality of life and health of patients was assessed based on the VAS scale. It was analysed to what extent previous COVID-19 infection affected life quality and how many respondents felt the effects more often. It was investigated what factors had an impact on the subjective reduction in life quality and worse health perception. The focus was on the assessment of somatic sensations, physical condition, and physical and mental agility, disregarding economic conditions and the social status.

The study was conducted from December 2020 to June 2021.

The Bioethics Committee of the Medical University of Silesia in Katowice decided that the above study did not require any additional assessment (PCN/CBN/0022/KB/143/21).

Statistical analysis

Percentages and means with standard deviations are reported in this study. The impact of demographic, medical and infection-related factors on the perception of life quality and health was analysed using logistic regression analysis. Effects significant at $p < 0.05$ are reported in the paper. Standard errors in the model were calculated by the Huber-White method. The analyses were performed using the Stata MP 17.0 software.

RESULTS

The study was based on the analysis of questionnaires completed by 337 respondents, including 173 females.

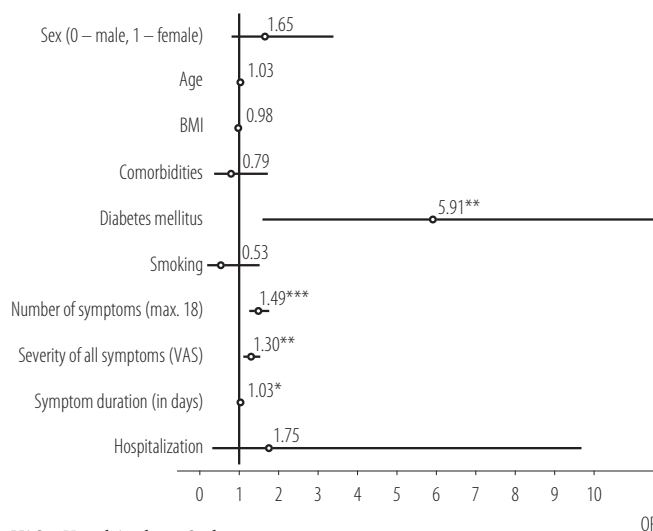
Table 1. Studied patients – employees of the Bolesław Śmiały Coal Mine in Łaziska, Poland, treated in the first half of 2021 in the ENT Clinic in Zabrze and Katowice, Poland

Variable	Participants (N = 337)	
	n	%
Sex (1 – female)	315	55
Age (M±SD 43.98±13.47 years)	335	
BMI (M±SD 27.07±8.35)	299	
Blood group		
0		
RH+	210	23
RH-	210	6
A		
RH+	210	28
RH-	210	10
AB		
RH+	210	8
RH-	210	2
B		
RH+	210	19
RH-	210	3
Smoking	298	14
Type 2 diabetes mellitus	298	4
Comorbidities	284	30
respiratory	281	3
cardiovascular	283	22
autoimmune	282	8
oncological	283	2
Hospitalization for COVID-19	301	5
passive oxygen therapy	301	4
intensive care	301	1

n – basis for percentage and mean calculations (number of valid observations, differences due to missing data).

The study participants were 18–86 years old. The mean age of the study group was 43.98±13.47 years. The other data and comorbidities are presented in Table 1.

Logistic regression was performed with the dependent variable “the impact of COVID-19 on health and life quality” and independent variables – demographic and medical characteristics of patients and information about the course of COVID-19 (Wald χ^2 (10, N = 224) = 66.31, p = 0.000), pseudo R² = 0.29). The results are presented in Figure 1.



VAS – Visual Analogue Scale.

Robust Huber-White standard errors.

* p < 0.05, ** p < 0.01, *** p < 0.001.

Figure 1. Odds ratios (ORs) of logistic regression of demographic and medical characteristics and information about the course of COVID-19 for a declaration of (negative) impact on overall health/life quality, employees of the Bolesław Śmiały Coal Mine in Łaziska, Poland, treated in the first half of 2021 in the ENT Clinic in Zabrze and Katowice, Poland

According to 46% of the respondents, COVID-19 had an impact on their life quality and health. The remaining 54% did not notice such an impact. People with type 2 diabetes mellitus had a significantly higher chance of experiencing a negative impact of COVID-19 on the quality of life. As there were only 12 such people in the sample, the estimated effect is not reliable (very wide confidence intervals).

Demographic (sex, age) and medical (BMI, comorbidities, hospitalization) characteristics did not affect the negative assessment of the impact of COVID-19 on the current health status and quality of life of the respondents. Naturally, however, it was influenced by the number of symptoms, their duration and severity. The chance for patients to see the negative effects of COVID-19 on their current health status/quality of life increased with each subsequent symptom of the disease by 49%, with each day of occurrence by 3%, for each VAS point of the severity of all infection symptoms by 30%.

The most frequently reported symptoms included: general weakness reported by 91% of the respondents, musculoskeletal pain (77%), olfactory disorders (72%), dysgeusia (68%), headache (65%) and cough (56%). The mean duration of symptoms was 13.61±10.44 days. The symptoms with the highest scores on the VAS scale were: dysgeusia (VAS 6.79), cacosmia (VAS 6.72) and general weakness (VAS 6.25) (Table 2).

Table 2. Descriptive statistics of ear, nose and throat (ENT) and systemic COVID-19 symptoms, employees of the Bolesław Śmiały Coal Mine in Łaziska, Poland, treated in the first half of 2021 in the ENT Clinic in Zabrze and Katowice, Poland

Symptom	Participants (N = 337)		M±SD	Positive answers [n]
	n	%		
Dysgeusia (VAS)	332	68	6.79±3.01	160
completely resolved	285	65		
duration of symptoms [days]			12.88±13.84	199
Olfactory disorder	334	72		
complete loss of smell [days]	286	43	15.69±17.84	111
from the first symptoms to the loss [days]			3.78±2.15	116
fully regained	121	78		
partially regained	121	19		
partial loss of smell (VAS)	274	23	5.69±2.89	62
cacosmia (VAS)	271	11	6.72±3.03	29
Headache (VAS)	334	65	5.37±2.41	204
Sore throat (VAS)	298	39	4.28±2.16	109
Dizziness/vertigo (VAS)	300	30	4.01±2.01	91
completely resolved	93	78		
partially resolved	93	17		
duration of symptoms [days]			7.97±7.59	80
Tinnitus (VAS)	307	14	3.87±1.98	30
completely resolved	42	48		
partially resolved	42	21		
duration of symptoms [days]			14.74±12.56	23
Hearing impairment (VAS)	332	14	3.81±2.37	31
completely resolved	42	45		
partially resolved	42	38		
duration of symptoms [days]			n.d.	3
General weakness (VAS)	336	91	6.25±2.37	268
Musculoskeletal pain (VAS)	333	77	5.67±2.49	229
Cough (VAS)	335	56	4.79±2.56	168
Runny nose (VAS)	296	38	4.35±2.28	106
Fever >38°C [days]	335	39	4.78±3.96	109
Dyspnoea (VAS)	335	32	4.83±2.59	98
Memory impairment (VAS)	296	25	4.07±2.02	72
Diarrhoea (VAS)	321	23	4.24±2.44	70
Movement disorders (VAS)	296	11	5.81±2.49	32
Conjunctivitis (VAS)	331	11	4.48±1.81	29
Skin lesions (VAS)	332	7	5.00±2.40	19
Testicular pain	130	2	n.d.	4
Vomiting	320	3	n.d.	8

Table 2. Descriptive statistics of ear, nose and throat (ENT) and systemic COVID-19 symptoms, employees of the Bolesław Śmiały Coal Mine in Łaziska, Poland, treated in the first half of 2021 in the ENT Clinic in Zabrze and Katowice, Poland – cont.

Symptom	Participants (N = 337)		M±SD	Positive answers [n]
	n	%		
Symptoms				
severity (VAS)			4.97±2.23	271
duration [days]			13.61±10.44	276
Impact of COVID-19 on quality of life				
yes (VAS)	292	46	3.87±1.94	130
no		54		159

VAS – *Visual Analogue Scale* with a range of 1–10.

n – basis for percentage and mean calculations (number of valid observations, differences due to missing data).

DISCUSSION

The aim of the study was to investigate how often and to what extent COVID-19 disease had an impact on the quality of life and general health of the respondents, 46% of them stated that the disease had a negative impact on their quality of life and general health.

There is increasing evidence that COVID-19 has long-term effects on both hospitalized and non-hospitalized patients. It is caused not only by the persistence of symptoms, but also a reduction in the quality of life and deterioration of mental health [1,4,6,9,16,18].

Quality of life is a complex concept with numerous definitions [24]. Some researchers believe that the issue of quality of life is so subjective that it is difficult to formulate any norms or standards [25]. Despite this attitude, research into the quality of life in medicine should be of great importance, since medicine deals with health [24]. According to WHO, health is a state of complete physical, mental and social well-being [24]. This definition leaves a large area for individual interpretation. An individual who feels healthy is fully capable of leading a productive social and economic life. Therefore, the subjective assessment of the health situation by the patient seems to be at least as important as the one based only on objective medical research [24].

In medicine, the term health-related quality of life (HRQoL) is used, which is defined as the subjective perception by patients of the multifaceted influence of the disease [4,22,24]. This concept was introduced in 1990 by Schipper et al. [26] as a functional effect of a physical, mental and social response to illness and treatment, perceived subjectively by the patient, and the assessment of the patient's own life position during the treatment period. In turn, Cella and Tulsky define

HRQoL as an assessment of the patient's satisfaction with the current level of functioning in comparison to what they perceive as possible or ideal [23]. Considering the complexity of these issues, it is difficult to develop a uniform method for assessing the quality of life [20].

The quality of life can be assessed in various ways, using spontaneous statements, a series of pre-prepared questions, psychometric tests or standardized questionnaires. There are general questionnaires that are more universal and specific (detailed), which are used in strictly defined groups and relate to a specific disease [11,19,22]. Commonly used general questionnaires include *Euro-Quality of Life Questionnaire* (EQ-5D) consisting of 2 parts. The descriptive part includes the assessment of HRQoL in 5 categories: ability to move, self-care, normal activities, pain and discomfort, anxiety and depression. The second part is the *EuroQol Visual Analogue Scale* (EQ-VAS). It is a visual analogue scale on which the patient assesses their current health status ranged 0–100 [22]. Various general questionnaires are used, and the choice of the method for assessing life quality often depends on the researchers' preferences [19].

So far, there have been relatively few reports on the long-term effects of COVID-19 on general health, patients' well-being, physical and mental performance. The publications mostly concern life quality assessment among patients who were hospitalized due to SARS-CoV-2 infection, there are fewer data for non-hospitalized patients with mild or moderate COVID-19 [16].

Carfi et al. [8] emphasize the long-term persistence of symptoms after COVID-19, as well as the impact of SARS-CoV-2 on the quality of life. In their study, the authors used the EQ-VAS to assess the quality of life, where 0 meant the worst possible perception of

health, and 100 – the best image of health. Patients were examined approx. 60 days after the onset of the first COVID-19 symptoms. Only 12.6% of the respondents did not report any persistent symptoms, and 44.1% reported a deterioration in the quality of life. Fatigue, dyspnoea, chest pain, and arthralgia were the most commonly reported symptoms [8]. In the conducted study, similar results were obtained. In turn, Jacobs et al. [1] examined the persistence of symptoms and quality of life among patients 35 days after hospitalization for COVID-19. The study involved 183 individuals. It has been found that COVID-19 affects the quality of life. Fatigue and dyspnoea were the most commonly reported persistent symptoms. The persistence of one or more symptoms at day 35 after discharge was associated with a decreased chance for a subjective good or excellent assessment of life quality and general health. In the survey 16.9% of the convalescents assessed that they were in a poor mental condition. Only 29.9% of the people working before contracting COVID-19 returned to work <35 days post hospital discharge. There was no correlation between the occurrence of comorbidities and the impact of SARS-CoV-2 infection on the quality of life [1].

According to obtained data, patients with type 2 diabetes mellitus experienced the negative impact of COVID-19 on the quality of life to a greater extent, but there were relatively few of them in the study group to draw clear conclusions. Other comorbidities, as in the study by Jacobs et al. [1], did not reduce life quality. On the other hand, the quality of life was negatively affected by the number of symptoms, their duration and severity. A study carried out in France among 120 convalescents showed that persistent symptoms lasted >100 days after hospital discharge. As in the previous studies, the most commonly reported symptoms were fatigue and dyspnoea. However, HRQoL assessed >100 days post hospital discharge was quite satisfactory and, contrary to the previously described study, most of the patients returned to work [16].

The above study points out that over time, the impact of COVID-19 on quality of life is not that significant. Optimism is aroused by the study conducted by Santus et al. [12], the results of which suggest that the decreased HRQoL seen on discharge from hospital significantly improved in the first 15 days after leaving the ward. The improvement in overall HRQoL was clinically meaningful in approx. two-thirds of the patients.

Taboada et al. [5] assessed the patients' quality of life (N = 91) 6 months after admission to the ICU and

found that in the majority of patients (67%) it deteriorated. Advanced age, male sex, need for mechanical ventilation during ICU stay, duration of mechanical ventilation, the length of stay in the ICU and the length of hospital stay were associated with reduced quality of life and/or deterioration of the functional state 6 months after admission to the ICU. After 6 months, a significant percentage of the patients reported persistent exercise dyspnoea (57%), 37% reported weakness and muscle pain, whereas arthralgia occurred in 29% of the respondents. Only 15 (16%) patients were completely free of persistent symptoms [5]. A study performed in patients in China one month after hospitalization for COVID-19 also found that their HRQoL was significantly impaired. According to data from a study conducted in Brazil, patients who required mechanical ventilation and intensive care, as well as patients requiring longer hospital stays due to coronavirus infection complained of lower life quality 3 months post hospital discharge.

Women reported the deterioration of HRQoL more often. In general, patients asked about their HRQoL 3 months after contracting COVID-19 reported general worsening of the EQ-5D-3L index. The aforementioned study highlights the negative impact of COVID-19 on health-related quality of life and mental health [7].

The above studies were mainly carried out in groups of convalescents who were hospitalized, but most people diagnosed with COVID-19 do not require hospitalization, hence the interest in assessing the impact of mild and moderate SARS-CoV-2 infection. Similar analysis was carried out by Garratt et al. [18] among patients 1.5–6 months after contracting COVID-19. The results of the EQ-5D index of non-hospitalized convalescents did not differ from the norms of the general population. However, several important dimensions of HRQoL, including aspects of mental health, were lower than the norms for the general population.

Ordinola Navarro et al. [10] studied groups of hospitalized and non-hospitalized patients infected with COVID-19. A high percentage of the patients with decreased QoL was found. According to the cited authors, the decrease in life quality was not related to the severity of the disease. In the study 73% of the subjects were outpatients with mild or moderate disease, who experienced significant deterioration of all QoL parameters, and the symptoms persisted in a significant percentage.

Elkholi et al. [27] studied the effect of loss of smell in COVID-19 patients on quality of life. They found

a significant reduction in health-related quality of life among patients with the loss of smell. The respondents felt the direct impact of the loss of smell on their daily functioning.

They mainly complained about “less awareness of personal hygiene” and “less interest in eating and drinking” [27]. A HRQoL assessment showed that patients who developed COVID-19 with the loss of smell experienced significant effects of the disease on physical health, professional life, partnership, emotional stability and free time [14,27]. In this study, there was no direct impact of the loss of smell on the reduction in life quality.

Unfortunately, there are more and more reports of long-term COVID-19 symptoms (so-called long COVID-19) affecting the patients’ quality of life. This suggests that the disease and its effects go far beyond the acute phase of infection [3,14,15,18].

It is extremely important to introduce a long-term assessment of the health and quality of life of patients after acute SARS-CoV-2 infections and to develop support and rehabilitation programs for convalescents.

Limitations

The subjective quality of life after contracting COVID-19 was assessed only on the VAS scale, without using other standardized questionnaires. However, the study enables to recognize whether the problem of subjective reduction in life quality appears among patients after SARS-CoV-2 infection, and whether it depends on factors such as age, sex, general severity of symptoms, hospital stay, passive/active oxygen therapy, duration of symptoms, comorbidities. The study can be the starting point for a more detailed analysis of this issue and a complex assessment of the quality of life of convalescents.

CONCLUSIONS

The results of this study and reports from other centers leave no doubt as to the impact of the COVID-19 infection on the quality of life and health perception. The concept of “long COVID” appears increasingly more often, which may be the reason for long absenteeism from work. This is a new disease entity that deserves special attention. Patients presenting with non-specific, heterogeneous and chronic symptoms pose a diagnostic and therapeutic challenge for doctors. In the coming years, long-term mental support and rehabilitation programs for convalescents will be of great importance.

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