JOURNAL OF CLINICAL MEDICINE OF KAZAKHSTAN (E-ISSN 2313-1519)
Original Article DOI: https://doi.org/10.23950/jcmk/12644

Assessment of quality of life one year after in COVID-19 cases using the SF-36

Elmira Kaidar[1], Assiya Turgambayeva[1], Saule Kassymova[2]

[1]Department of Public Health and Management, Astana Medical University, Astana, Kazakhstan
[2]Graduate School of Public Policy, Nazarbayev University, Astana, Kazakhstan

Received: 2022-07-01.
Accepted: 2022-10-20

J Clin Med Kaz 2022; 19(6):13-17

Corresponding author:
Elmira Kaidar.
E-mail: elmira_kaidar@mail.ru;
ORCID: 0000-0003-1331-9152

Abstract

One of the features of COVID-19 infection is a long recovery process and development of the long-term health effects of COVID-19. Therefore, the interest of scholars in ensuring patients' quality of life after treatment of COVID-19 is increasing and puts a long-term health assessment on the agenda. However, there have been limited studies examining subjective evaluation of physical and mental health of patients who have undergone COVID-19 in Kazakhstan.

The study aims to examine the subjective health assessment of patients who suffered from COVID-19 in 2020 and 2021 in Nur-Sultan city using the SF-36 tool. These patients were included and observed in the research with confirmed and probable COVID-19 cases as well as their close contacts.

Material and methods: The study employed questionnaires of respondents through direct interviews, including common questions SF-36. The scoring was done in Microsoft Excel. Statistical analysis of data was performed using the SPSS program, version 23.

Results: Questionnaires were administered among 64 out of 172 patients, 52 (81%) were women and 12 (19%) were men. The majority of respondents were over 40 (41%) and 31 (31%) years old. Nearly half of participants (46%) responded that their health condition was about the same as a year ago, 27% rated their health somewhat worse than a year ago, and 2%, that is, 1 participant, rated their condition as much worse than before COVID-19. Men considered themselves significantly healthier than women ($p>0.05$).

Conclusion: There is a need for additional research on "Long COVID-19" using more specific HRQoL instruments.

Key words: COVID-19, quality of life, outcomes, SF36, health **evaluation**

Introduction

Coronavirus disease (COVID-19) is an infectious disease caused by the rapid spread of coronavirus (SARS-CoV-2) among people via droplets that contain the virus [1]. In the early stages of the disease, patients often develop severe pulmonary pneumonia, and acute respiratory distress syndrome that can lead to severe consequences including multiple organ failures [2]. In addition to the pulmonary system, COVID-19 can affect many other organ systems, including the neurological (anosmia, consequences of thromboembolic events such as stroke, cognitive impairment), cardiovascular (damage to the heart muscle, heart failure), also cause anxiety, depression, sleep disorders, musculoskeletal problems and fatigue [3]. One of the features of COVID-19 coronavirus infection is the long recovery from the disease so called "Long/post COVID-19" that characterizes with high fatigue, shortness of breath, cough, sleep disturbance, muscle pain, depression, etc. and may last from few weeks to years. According to the World Health Organization, 10-20% of the population develops medium- or long-term effects after suffering COVID-19 [4]. Furthermore, a systematic review of articles shows that 59% of patients with "Long COVID-19" rate their health status as poor, with predominant symptoms of high fatigue, shortness of breath, sleep disturbances, and psychological disturbances [5], which directly affect their physical activity and performance capacity. Therefore, the interest in ensuring the quality of life after undergoing COVID-19 is increasing in the academia that makes the continuous health assessment of COVID-19 patients essential in subsequent years.

To evaluate health of patients, the health-related quality of life (HRQoL) is commonly used in clinical

practice and public health field that allows to assess subjective feeling of patients concerning the impact of the disease through 36-item questionnaire (SF-36) [6,7]. Most of studies shows that the Long COVID-19 negatively affects both physical and mental HRQoL, however the symptoms and characteristics of "Long COVID-19" vary by country. For example, in Wuhan Province, China, among 2469 patients who had coronavirus infection, 55% had low HRQoL for the next two years, namely patients experienced fatigue, muscle weakness, low physical activity tolerance and psychological health problems. At the same time, 89% of patients who underwent COVID-19 returned to their original job only after two years. Nevertheless, overall health at two years was significantly worse in those with severe COVID-19 compared with the general population [8]. A similar pattern was described in Bangladesh, where more than 80% of patients had symptoms of "Long COVID-19" such as fatigue and pain for the next three months after recovery, which limited patients' functional activity [9]. In Turkey, 40% of patients had pain in their joints and lower back for the next three months after recovery [10].

The leading causes of "post-COVID-19" symptoms in the American study were identified as physical exertion, stress, and dehydration. With the appearance of cognitive dysfunction, the patients' level of social activity decreased, which affected their physical activity and performance [11]. Moreover, after entering the workplace, many patients report high fatigue (60-70%) [12]. Only 10.8% of patients in Egypt noted that they had no symptoms after suffering COVID-19, whereas the majority responded that there was prolonged fatigue. In rare cases, patients after recovery from COVID-19 had stroke, renal failure, myocarditis, and pulmonary fibrosis [13]. Thus, most patients develop post-COVID-19 syndrome or "Long COVID-19", which manifests in mild symptoms such as fatigue, muscle pain, and cough, and in a severe form with exacerbation of chronic diseases or complications such as stroke, myocarditis and others.

There is limited literature on examining the effects of coronavirus infection on human health, specifically the subjective assessment of health, both physical and mental, on patients who have undergone COVID-19 in Kazakhstan. The study in Shymkent showed that more than 85% of elderly respondents had post-convulsive complications in the form of increased fatigue, hair loss, myalgia, shortness of breath, fever and headache. Nevertheless, the authors emphasize that a differential diagnosis is necessary since these symptoms cannot always be justified only by the post-covid condition of patients and can manifest during the ageing process and chronic diseases. Notwithstanding, the prolonged character of these symptoms appears more in the category of older adults [14]. Moreover, there is no analysis of patients' subjective self-assessment of their health one year after COVID-19 in Nur-Sultan city. This study aimed to examine the subjective health assessment of COVID-19 patients who were included and observed in a study of confirmed and probable COVID-19 cases and their close contacts in 2020 and 2021 in Nur-Sultan, using the SF-36 questionnaire. Based on the literature review, the study hypothesizes that the health of Kazakhstani population has worsened after recovery from COVID-19. The study limited assess the general state of patients who had COVID-19 infection without specifying the symptoms that persisted or reappeared.

Material and methods:

The study conducted within the international project of the WHO, National Center of Public Health and Astana Medical University "Investigation of confirmed and probable cases of COVID-19 and their close contacts" according to a specially developed protocol approved by the Ethics Committee.

A prospective study included 122 patients with varying degrees of severity and with a confirmed diagnosis of COVID-19 by PCR who were on outpatient treatment in Nur-Sultan, as well as 50 patients who were hospitalized with a clinical picture of COVID-19 but with a negative PCR result and with signs of COVID-19 pneumonia, aged 0 to 90 years. Further, close contacts of confirmed and probable cases were also included in the study. A follow-up of cases and their close contacts was conducted from November 26, 2020 to February 15, 2021.

Sixty-four out of 172 patients participated in the survey. The survey based on subjective assessment of their health conducted one year after the coronavirus infection, in April 2022, according to the study design. Patients were included in the study only after signing the consent to participate in the study.

The exclusion criteria of participants recruitment were patients who died before the start of follow-up, patients whose observation was difficult due to repeated hospitalization or immobilization before or after discharge due to diseases such as stroke or pulmonary embolism and other complications, patients who refused to participate in the study.

The SF-36 questionnaire is commonly used in the medical field to assess the health of individuals or populations by grading eight health dimensions. Due to restriction policy during the conducting data collection, the survey distributed online to collect the data in a safe and effective manner. Respondents filled out questionnaires independently after receiving information about purpose of the research, how the results will be used and the main rules of filling out the SF-36 questionnaire. Standard questionnaire SF-36 has three levels: - 36 questions; - 8 scales. The following scales were analyzed: Physical function (PF), Role Physical (RP), Bodily Pain (BP), General Health (GH), Vitality (VT), Social Functioning (SF), Role Emotional (RE), Mental Health (MN). Thus, the SF-36 questionnaire summarizes two components: physical and mental. The scoring of the scale was from 0 to 100, where 100 represents total health, and the calculation was made using the SF-36 questionnaire scoring methodology in Microsoft Excel.

Before calculating the scores of the 8 scales, the responses were recorded in MS Excel, then the scores were summed to obtain the values of each scale according to the methodology presented in the SF-36 application manual [15]. Equivalent scores are assigned to responses, where 100 is the highest and 0 is the lowest.

Since the majority of the patients from the original study declined or could not be interviewed one year later, the sturdy found it unrepresentative to classify them by disease severity, level of medical assistance or socio-economic status due to the small sample.

Ethical aspects

Before starting the study, all documents, including the research protocol and data collection questionnaires, underwent expert review and received positive approval from the Local Ethics Commission of the NJSC Astana Medical University, Minutes of Meeting No. 9 of 09.09.2020. Patients were included in the study only after they received full information about it and gave written voluntary consent to participate. All information collected concerning the health status of patients is provided with confidentiality in accordance with the Law of the Republic

of Kazakhstan dated May 21, 2013, N 94-V "On Personal Data and Their Protection" and Article 28 of the Code of the Republic of Kazakhstan "On Public Health and Health Care System". Before the study began, the entire research team signed a non-disclosure agreement.

Statistical analysis

Statistical analysis was performed using SPSS software, version 23. The validity and reliability of the SF-36 questionnaire were tested, and statistical parameters such as the mean, standard deviation, and percentage calculation were described.

Results

The survey was obtained by 64 out of selected 172 patients, 108 individuals were unreachable or denied participation, and therefore, there survey response rate was 37%. Since there was limited data on the SF-36 measurements and the study sample was small, this study did not perform an in-depth statistical data analysis. At the time of this survey in average 410 days have passed since the last patient included in the study received a positive PCR result. According the study protocol it was planned to conduct a survey one or a year and a half later to examine long-term health effects after COVID-19.

Fifty-two (81%) women and 12 (19%) men participated in the study. Most respondents were over 40 years old (41%) and 31 to 35 years old (31%). A large proportion of study participants responded that their health conditions about the same as it was a year ago (46%), 27% of respondents assessed their condition as somewhat worse than a year ago, and 2%, that is, 1 participant assessed his condition as much worse than before COVID-19 (Table 1). The highest possible score for a health dimension would be 100, which reflects a very high quality of life in that area. The lowest possible score is 0, which reflects a very low quality of life in that area.

Table 1 Distribution of respondents by gender and age.

Age	Total (N)	Gender composition (% of sample size)	
	Number of respondents (% of the sample size)	Male	Female
Under 25 years old	4 (6,25)	1 (1,56)	3 (4,69)
26-30 years old	2 (3,13)	0 (0)	2 (3,13)
31-35 years old	20 (31,25)	4 (6,25)	16 (25)
36-40 years old	12 (18,75)	2 (3,13)	10 (1,56)
40 and above years old	26 (40,63)	5 (7,81)	21 (32,81)

Table 2 Averages of 8 SF-36 scales (N=64).

SF-36 scales	M	∂
PF	70,78	28,78
RP	69,53	34,64
BP	74,59	21,59
GH	64,95	18,19
VT	56,79	17,71
SF	74,61	17,67
RE	63,54	43,53
MH	58,63	14,77

Bodily Pain (BP), General Health (GH), Mental Health (MN), Physical function (PF), Role Physical (RP), Role Emotional (RE), Social Functioning (SF), Vitality (VT).

The mean values of the eight transformed SF-36 respondents' scales are in Table 2. The mean physical functioning (PF) was at 70.78%, which reflects high physical functioning. The mean role limitations due to physical health (RP) were at 69.53%, where respondents were not enough limited due to physical health. The mean role limitations due to emotional problems (RE) were at 63.5%, where respondents were moderately limited due to emotional problems. Vitality (VT) was at 56.9%, where respondents had moderate vitality levels. Social functioning (SF) was at 74.6%, where respondents were fairly high socially functioning. Body Pain (BP) was at 74.6%, where respondents were in enough pain for a time. General health was at 64% and Mental health was at 58,6% which is mildly-to-moderate.

Validity and reliability analysis

Questionnaire responses were tested with the recommended reliability and validity tests. Internal consistency is the degree to which items within one dimension correlate [16]. We used nonparametric versions of these tests to avoid assumptions about the distribution. The internal consistency was acceptable. Correlations between items and correlations of own measurements, after correction for overlap, did not exceed 0.6 for all items. Cronbach's alpha coefficient did not exceed the recommended minimum of 0.764, and reliability coefficients were above 0.731 for all dimensions except role activity (a=0.725), and vitality (a=0.727) (Table 3).

Table 3 Reliability of the SF-36 questionnaire.

SF-36 scales	Correlation between item and total	Cronbach's Alpha
PF	,468	,738
RP	,543	,725
BP	,379	,752
GH	,547	,733
VT	,603	,727
SF	,572	,731
RE	,436	,774
MH	,592	,735

Bodily Pain (BP), General Health (GH), Mental Health (MN), Physical function (PF), Role Physical (RP), Role Emotional (RE), Social Functioning (SF), Vitality (VT).

Table 4 shows the distribution of SF-36 scale scores by gender and age. The distribution of scores was as expected, indicating the validity of the survey tool. Men considered themselves significantly healthier and scored higher than women ($p>0.05$) on all scales except for the role-activity dimension. Significant results were found for physical functioning and bodily pain ($p>0.05$), but a slight gradient was found for mental health ($p=0.75$). Younger respondents, those under 25 years of age, in contrast to other age groups, scored better on social functioning, pain, and mental health and also presented an excellent gradient on general health ($p>0.05$). Respondents in the 26-30 age group scored highest on emotional state, role functioning, and general health ($p>0.05$) but were vulnerable to bodily pain. Individuals in the 36-40 age group performed well on average on all dimensions except mental health ($p=0.23$) and vitality ($p=0.75$).

The physical and mental health

The physical component was higher among males and was 53.3 (CI 95% 48.4; 54.2). Among females this component was assessed at 47.5 (CI 95% 46.1; 48.9), ($p=0.2$) which is moderate-

Table 4 Average scores on the SF-36 questionnaire dimensions concerning respondent gender and age.

Variables	Number (n)	Physical functioning (PF)	Social functioning (SF)	Role Physical (RP)	Role emotional (RE)	Body Pain (BP)	Mental Health (MH)	Vitality (VT)	General Health (GH)
Age (years)									
< 25	4	80,0	81,9	75,0	41,7	81,9	63,0	61,3	68,5
26-30	2	52,5	75,0	100,0	100,0	69,5	48,0	65,0	69,5
31-35	20	76,5	72,5	67,5	70,0	74,3	58,4	56,3	62,1
36-40	12	85,0	79,2	79,1	63,9	77,0	56,3	54,2	64,8
> 40	26	59,8	73,1	63,5	60,0	73,0	60,0	57,1	66,3
Sex:									
Male	12	79,6	78,1	66,7	69,4	85,7	58,6	60,4	68,4
Female	52	68,8	73,8	70,2	62,2	72,0	58,7	60,0	64,1

to-severe. 11 (55%) individuals assessed the physical component of Physical Health>=50 in the 31-35 age group, one individual (50%) among the 26-30 age group, three individuals (75%) from the under-25 age group, 36-40 age group, six individuals (50%), and nine individuals (35%) among the over-40 age group, (p=0.05).

The mental component was rated almost equally among both sexes at 43.5 (CI 95% 42; 45) among women and 43.7 (CI 95% 40.8; 46.6) among men (p=>0.05). Among age groups, this component was the least pronounced, i.e. Respondents considered themselves vulnerable to the mental stateside. The psychological component was assessed moderate-to-high (PsH>=50) by 8 (40%) persons in the age group 31-35 years, one person (25%) among the age group under 25 years, two persons (17%) among the age group 36-40 years, and six persons (23%) among the age group over 40 years (p=>0.05).

Discussion

The majority of respondents from this study were more or less satisfied with their health, which is indicated in the evaluation scales used in the research that are all relatively good - above 50. However, the one of the indicators, Body Pain (BP), was quite prevalent among most respondents (74%). This could be explained by the age of most participants, over 36 years old, which makes them more predisposed to have chronic diseases with pain syndrome. A systematic literature review by Figueiredo et al. (2022) depicted similar results where older people and females are the most vulnerable group who are predisposed to experience physical and mental impairments after recovery from COVID-19 [17]. Nevertheless, our study shows that the physical health was moderate-to-severe and higher among males than in women on all scales of the SF-36 questionnaire, while mental health was moderate-to-severe in both sexes.

Most of respondents expressed that they did not feel healthy after recovery from COVID-19 due to uncertainty of the pandemic and quarantine measures that have led to prolonged stays indoors. The lowest score in mental health was recorded among group of people who are younger than 30 years old. Both male and female had below average score of mental health. Similar study in the Philippines demonstrates that although individuals had better results in “Physical functioning” (PF) and “Role of limitation due to physical health” (RP) (85 % and 100%) their General and Mental health were poorer (50% and 44%) [18]. Other scholars show that after recovery from COVID-19 many individuals reported significant level of stress, anxiety, and depression symptoms, which might have long-term psychological consequences [19,20]. For example, in comprehensive cross-sectional research of over 1000 Chinese, scholars found 71.5%of participants expressed distress, 50.4% depression, 44.6% anxiety, and 34.0% insomnia, correspondingly [21]. In the retrospective perspective, O’Brien et al. (2022) claim that the issue of concentration and memorizing is keep growing in the period between six months to one year after recovery from COVID-19. Individuals complain about their lower ability to work and exercise at previous pace that affects their well-being [22]. This study did not focus on abilities of work and exercise after recovering from COVID-19, which should be looked at in the future studies.

The cumulative mean HRQoL score in the study was moderate-to-severe (45.89±10.37). Similar research conducted in China illustrated high HRQoL score (62.1±18. 8) [23]. Other studies show the total mean HRQoL score in patients with acute COVID -19 60.3 [24], and in patients with "Long COVID -19" - from 60.4 [24] to 86.4 [25], where a higher SF-36 score reflects better health status. The lowest HRQoL score (60.4) was in older patients (>65 years), and the highest HRQoL score (86.4) was among younger patients (54%, 18-46 years) and all patients without comorbidities. This indicates that the HRQoL of survey Kazakhstani population is relatively poorer than in other countries. Therefore, further qualitative research is warranted to explore individuals’ perceptions and experience of recovering physical and mental health in-depth.

Some limitations are present in the research. First, there was a high patient refusal rate; many patients failed to contact the research team or did not want to participate in the survey. Second, due to the absence of a specific mental status scale, only four aspects, namely SF, VT, MH, and RE, were assessed. Third, the presence or absence of symptoms characteristic of "protracted covid" was not traced, nor was the relationship to socioeconomic status, level of education, or presence of comorbidities. Moreover, due to the heterogeneity of results presentation on the effect of COVID-19 on HRQoL on the global scale and the lack of data that was captured one year after recovery from COVID-19, it was hard to compare the results of the study with results from other countries. However, compared to previous similar studies on HRQoL and Long COVID-19 that surveyed in the period between 4 and 12 weeks from the onset of symptoms, this study employed a survey a year after the inclusion of the last patient in the study, which gave a better opportunity to look at the long-term impairments after recovery from COVID-19.

Conclusion

Analysis of the HRQoL indicators of the study group in Nur-Sultan city, Kazakhstan showed that the male population had a better quality of life indicators on all scales of the SF-

36 questionnaire compared to the female population (p>0.05). Younger respondents under 30 had above-average scores on all scales except mental health. This score was the lowest among the other age groups. However, this age group rated overall health above average, regardless of gender. Respondents over 40 also rated their general health above the average level, and they were characterized by high scores on the scales of social activity and bodily pain. Mental health was rated below average among both sexes almost equally at 43.5(CI 95% 42; 45) among women and 43.7 (CI 95% 40.8; 46.6) among men (p=>0.05).

Thus, there is a need for additional research on quality of life and health status one year after COVID-19 using standard, more specific HRQoL instruments (e.g., EQ-5D, SF-6D) as well as disease-specific instruments with a standard method of HRQoL calculation and statistical presentation (i.e., mean scores for each dimension with standard deviation and 95% confidence interval, medians with range or patient shares). It would also be helpful to include additional questions on symptoms, comorbidities, and on detecting depression in COVID-19 patients.

Disclosures: There is no conflict of interest for all authors.

Acknowledgements: None.

Funding: None.

References

1. World Health Organisation. *Coronavirus*. 2020. https://www.who.int/health-topics/coronavirus#tab=tab_1
2. F. Zhou et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *The Lancet*. 2020; 395(10229):1054–1062. https://doi.org/10.1016/S0140-6736(20)30566-3
3. World Health Organization. What we know about Long-term effects of COVID-19 (coronavirus update 36). 2020. https://www.who.int/publications/m/item/update-36-long-term-effects-of-covid-19
4. Coronavirus disease (COVID-19): Post COVID-19 condition. https://www.who.int/news-room/questions-and-answers/item/coronavirus-disease-(covid-19)-post-covid-19-condition
5. P. Malik et al. Post-acute COVID-19 syndrome (PCS) and health-related quality of life (HRQoL)-A systematic review and meta-analysis. *J Med Virol.* 2022; 94:253–262. https://doi.org/10.1002/jmv.27309
6. S. Polinder et al. A systematic review of studies measuring health-related quality of life of general injury populations. *BMC Public Health.* 2010; 10:783. https://doi.org/10.1186/1471-2458-10-783
7. Y. Mouelhi, E. Jouve, C. Castelli, and S. Gentile. How is the minimal clinically important difference established in health-related quality of life instruments? Review of anchors and methods. *Health Qual Life Outcomes*. 2020; 18(1):136. https://doi.org/10.1186/s12955-020-01344-w
8. L. Huang et al. Health outcomes in people 2 years after surviving hospitalisation with COVID-19: a longitudinal cohort study. *Lancet Respir Med.* 2022. 10(9):863-876. https://doi.org/10.1016/s2213-2600(22)00126-6
9. M. Anwar Hossain et al. Prevalence of Long COVID symptoms in Bangladesh: a prospective Inception Cohort Study of COVID-19 survivors. *BMJ Glob Health.* 2021; 6:6838. https://doi.org/10.1136/bmjgh-2021-006838
10. F. Karaarslan, Fulya, D. Güneri, and S. Kardeş. Long COVID: rheumatologic/musculoskeletal symptoms in hospitalized COVID-19 survivors at 3 and 6 months. *Clin Rheumatol.* 2022;41(1):289-296. https://doi.org/10.1007/s10067-021-05942-x
11. L. Tabacof et al. Post-acute COVID-19 Syndrome Negatively Impacts Physical Function, Cognitive Function, Health-Related Quality of Life, and Participation. *Am J Phys Med Rehabil.* 2022; 101(1):48-52. https://doi.org/10.1097/PHM.0000000000001910
12. S. J. Halpin et al. Postdischarge symptoms and rehabilitation needs in survivors of COVID-19 infection: A cross-sectional evaluation. J Med Virol. 2021; 93:1013–1022. https://doi.org/10.1002/jmv.26368
13. Marwa Kamal, Marwa Abo Omirah, Amal Hussein, and Haitham Saeed. Assessment and characterisation of post-COVID-19 manifestations. *The international journal of Clinical Practice.* 2020; 75:1–5. https://doi.org/10.1111/ijcp.13746
14. G.N. Abuova, G.A. Aitmuratova, T.V. Polukchi, F.A. Berdaliyeva, G.A. Utepbergenova. Assessment of residual effects and consquances of COVID-19 in elderly and senile people in Shymkent. *Vestnik*. 2021; 3:330–334. https://doi.org/10.53065/kaznmu.2021.64.62.063
15. Ware J.E., Snow K.K., Kosinski M., and Gandek B. Medical Outcomes Study Questionnaire Short Form 36 Health Survey (SF-36). 1993.
16. J. E. Brazier, R. Harper, N. M. B Jones, K. J. Thomas, T. Usherwood, L. Westlake. GENERAL PRACTICE Validating the SF-36 health survey questionnaire: new outcome measure for primary care. *BMJ.* 1992; 305(6846):160-4. https://doi.org/10.1136/bmj.305.6846.160
17. E. A. B. Figueiredo et al. The health-related quality of life in patients with post-COVID-19 after hospitalization: a systematic review. *Revista da Sociedade Brasileira de Medicina Tropical.* 2022; 55. https://doi.org/10.1590/0037-8682-0741-2021
18. M. Aquino. Measuring Health-Related Quality of Life in the Time of COVID-19 with SF-36: A Population-Based Study in the Philippines. *Manila*. [Online]. 2020; https://www.researchgate.net/publication/348919571
19. R. Buselli et al. Professional Quality of Life and Mental Health Outcomes among Health Care Workers Exposed to Sars-Cov-2 (Covid-19), *Int J Environ Res Public Health.* 2020; 17(6180):1–12. https://doi.org/10.3390/ijerph17176180
20. R. Adjafre et al. Quality of Life Prior and in the Course of the COVID-19 Pandemic: A Nationwide Cross-Sectional Study with Brazilian Dietitians. *Int J Environ Res Public Health.* 2021; 18(5):2712. https://doi.org/10.3390/ijerph18052712
21. S. Pappa, V. Ntella, T. Giannakas, V. G. Giannakoulis, E. Papoutsi, and P. Katsaounou. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. *Brain, Behavior, and Immunity. Academic Press Inc.* 2020; 88:901-907. https://doi.org/10.1016/j.bbi.2020.05.02
22. K. O'Brien et al. 1-year quality of life and health-outcomes in patients hospitalised with COVID-19: a longitudinal cohort study. *Respir Res*. 2022; 23(1). https://doi.org/10.1186/s12931-022-02032-7
23. H. C. Nguyen et al. Clinical Medicine People with Suspected COVID-19 Symptoms Were More Likely Depressed and Had Lower Health-Related Quality of Life: The Potential Benefit of Health Literacy. *J. Clin. Med*. 2020; 965. https://doi.org/10.3390/jcm9040965
24. K. Liu, W. Zhang, Y. Yang, J. Zhang, Y. Li, and Y. Chen. Respiratory rehabilitation in elderly patients with COVID-19: A randomized controlled study. *Complement Ther Clin Pract.* 2020; 39. https://doi.org/10.1016/j.ctcp.2020.101166
25. L. Guo et al. Correlation Study of Short-Term Mental Health in Patients Discharged After Coronavirus Disease 2019 (COVID-19) Infection without Comorbidities: A Prospective Study. *Neuropsychiatr Dis Treat.* 2020; 16:2661-2667. https://doi.org/10.2147/NDT.S278245