Prevalence of Musculoskeletal, Neurological and Physical Disorder After COVID-19 in Saudi Arabia: A Cross Sectional Study [version 3; peer review: 2 approved]

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Abstract
Background: The global pandemic of SARS-CoV-2, or COVID-19 continues to attack all human systems. Although COVID-19 is a respiratory disease, various extra-pulmonary manifestations, including musculoskeletal and neuropathies/myopathies was reported. This study aimed to investigates the long-term impacts of COVID-19 infection on physical health, capability of daily life activities, musculoskeletal and neurological functions in the Kingdom of Saudi Arabia (KSA). Methods: A total of 499 adults recovered from COVID-19 infection of both sexes, who resided in the KSA were recruited randomly and invited to participate in this cross-sectional web-based survey. A self-administered structured questionnaire was used as an instrument of data collection. All respondents returned the questionnaire. Their responses were recorded, stored into a Microsoft Excel sheet 2010 and analyzed with the Statistical Package for the Social Sciences (SPSS) version 24. Percentages were used to convey descriptive data. The percentages were presented with a 95% confidence interval (CI). For statistical significance, a 0.05 p-value was used. Results: The overall prevalence of neurological and musculoskeletal disorders as follows: headache (63.1%), muscle ache or weakness (62.3%), vertigo (25%), concentration problems (21.8%), breathing troubles (20.4%), loss of balance (19.4%), seizure (1%), and Guillain-Barre Syndrome (0.6%). The results also revealed a significant association between the influence of COVID-19 infection and daily activities, gender and respiratory disorders. Conclusion: The findings highlighted and concluded that COVID-19 infection had an impact on respiratory, nervous, musculoskeletal systems and affect daily activities.
Keywords
COVID-19, headache, muscle weakness, respiratory difficulties, physical activities

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Author roles: Mahmoud H: Conceptualization, Data Curation, Funding Acquisition, Methodology, Resources, Validation, Writing – Original Draft Preparation, Writing – Review & Editing; Ebid A: Conceptualization, Data Curation, Formal Analysis, Funding Acquisition, Investigation, Methodology, Project Administration, Resources, Software, Supervision, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; Alghamdi M: Conceptualization, Formal Analysis, Investigation, Methodology, Software, Supervision, Writing – Original Draft Preparation, Writing – Review & Editing; Ibrahim A: Conceptualization, Data Curation, Investigation, Methodology, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; Almoosa A: Conceptualization, Formal Analysis, Investigation, Methodology, Supervision, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing

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Introduction

The global pandemic of coronavirus disease 2019, commonly known as COVID-19, continues to spread. The clinical presentations of COVID-19 varied from asymptomatic to severe critical condition. Although COVID-19 is a respiratory disease, numerous investigations documented extrapulmonary signs and symptoms. Musculoskeletal complaints, myopathies, and neuropathies are common post COVID-19 clinical presentations. Patients with multiple manifestations ranged from asymptomatic or moderate (70% of cases) to severe or possibly fatal (30% of cases).

Although the severity of the symptoms varied with age and medical history of chronic diseases (comorbidity, such as chronic cardiac disease, lung disease, diabetes, chronic renal disease, and cancer). The most common symptoms included fever, cough, shortness of breath, fatigue, myalgia, hypertension, headache and gastrointestinal symptoms. These symptoms may last for a long time even after recovery. Symptoms might linger for weeks or months, and some people never return to their previous level of health.

In this regard, the emergence of COVID-19 has compelled governments worldwide to take different steps and decisions to prevent the pandemic from spreading quickly. Social distancing, capacity constraints in public venues and private houses, isolation, quarantine, and curfew enforcement were among the preventative measures employed. Saudi Arabia have been eager to apply social distancing and quarantine in order to avoid illness spread.

As a result, those preventative measures may have physical, emotional, and psychological impacts on people’s life. According to Mattioli et al., precautionary measures had a negative impact on individuals, the society, and the economy which resulted in (a) an increase of community anxiety and tension, (b) an economic decline, (c) decreased outdoor exercises and overall physical activity (PA), (d) and development of both stress and depression, which can lead to unhealthy dietary habits.

Although there are numerous examples of long-term problems after COVID-19 infection, there is lack of research to support. There was a loss in patients’ functional capacity, which was correlated to the reduction in numbers of health-related quality-of-life indices. There was also evidence of cognitive problems, such as confusion and memory loss. High blood pressure, obesity, and mental health disorders were identified as risk factors for the persistence of these symptoms. The importance of physical therapy in dealing with these issues should not be overstated. It is crucial to begin studying the long-term effects of COVID-19 infection. To our knowledge, there is a lack of information and no previous study on the correlation between the prevalence of neurological, musculoskeletal, and physical disorders and COVID-19 in KSA. So, we aimed in this study to determine the long-term impacts of COVID-19 on physical health, daily life activities, musculoskeletal and neurological functions in the KSA.

Methods

Ethical considerations

This was an analytical cross-sectional survey study. The King Abdullah International Medical Research Center (KAIMRC) approved and considered this study ethically feasible (Approval study number: SP21J/015/02, E-CTS Ref. No. JED-21-427780-20935 and IBR NCBE Registration No.:H-01-R-005).

Participants

A total number of 499 patients of both genders, aged from 20 to 60 years old who had issues following COVID-19 and lived in Saudi Arabia were included in this study. All participants received full information and an explanation of the study’s objectives, advantages, and any potential hazards associated with participation. All participants signed an informed consent form indicating their willingness to participate in this study. A random sampling was performed based on city districts. This research was carried out between October 2020 and March 2021.
**Sampling**

The required sample size was calculated using Raosoft sample size calculator (Raosoft, Inc., Seattle, WA, USA), with a confidence interval of 99%, a response rate of 70%, and a margin error of 5%. The sample size was 1200 participants. A two-stage sampling approach was employed to select participants, with a random sampling of participants from different districts followed by a random selection of participants from those districts. On a list of patients in the hospital database, 2000 participants were randomly selected for the first sample stage; however, 800 people had to be eliminated because of contact technical issues. The second stage involved approaching 1200 participants, but only 520 patients returned the questionnaire and 680 declined to participate. 21 respondents were excluded due to missing data. Finally, this study included 499 respondents (Figure 1).

**Instrument**

The research team first prepared the query, which was then sent to two different Arabic specialists to modify and correct any Arabic errors before being sent to a documented English translation office to prepare the final version of the questionnaire. It was reviewed by the ethical committee in The King Abdullah International Medical Research Center (KAIMRC). The questionnaire was submitted as a preliminary sample to see if there were any issues with it.

Participants completed a structured self-administered questionnaire, which was subsequently uploaded to an online survey software (Google Forms), as well as an instant messaging application (WhatsApp). The objective of the study, consent information to assure voluntary participation, as well as participants’ anonymity and confidentiality, were all included in the introduction section of the questionnaire. The questionnaire was easily accessible to the participants. Their responses were exported and analyzed once collected. The 17-question questionnaire yielded the following results: (a) Demographic characteristics, (b) Work or occupation, (c) Exercises performed prior to COVID-19 infection (type, frequency and duration), (d) Daily habits and tasks, (e) Chronic disease complaints (high blood pressure, heart and lung diseases, diabetes, cancer), (f) Duration of COVID-19 infection, (g) Accompanied Symptoms during COVID-19 infection (whether the symptoms persisted after recovery, duration and the target symptoms persisted). All the questions were written in basic, brief, and straightforward language, and the responses were organized in a straightforward manner.

![Figure 1. Flow diagram of sample selection.](image-url)
Data collection
The responses were gathered using a Google form. The survey link was sent to potential participants via WhatsApp and email. To increase the response rate, two reminders were sent at three-days interval and the responses were organized in a Microsoft Excel sheet 2010.

Statistical analysis
The results were analyzed with SPSS version 24 (SPSS Inc, Chicago, Illinois, USA) (RRID:SCR_002865). Chi-squared test was performed to calculate the percentages and correlations between categorical variables in the descriptive analysis. Percentages with a 95% confidence interval were also computed. The significance level was established at a $p$-value of 0.05. ANOVA test was utilized to compare the disability scores among participants. Since the duration of long-term symptoms was skewed, the median and interquartile range (IQR) were chosen to summarize the data. For categorical and ordinal variables, proportion was used.

Results
A total of 499 responses were presented and analyzed. Duration of persistent symptoms was set from one month to three months. Females made up nearly 70% of the samples, with the majority aged under 45 years. Among the participants, 245 (49.1%) were employed, including 60 (24.9%) civilian workers, 38 (15.8%) military members, 37 (15.4%) medical workers, and 254 (50.9%) were unemployed. Out of 499 respondents, 275 (55.1%) of the participants reported that they had practice of exercising before COVID-19 infection (mostly walking, 67.6%), while 224 (44.9%) had not participated in any type of exercises before COVID-19 infection. 394 (69.9%) females were affected, while 150 (30.1%) men were affected. Most of them (420 = 84.2%) were under 45 years old, and 79 (15.8%) were over 45 years old. 405 (81.2%) of the participants came from the Western region of Saudi Arabia. About 118 (23.6%) of the participants had chronic diseases, including respiratory disease (42 = 8.4%), diabetes mellitus (DM) (41 = 8.2%), hypertension (HT) (26 = 5.2%), cancer (5 = 1.0%), and cardiac disorders (3 = 0.6%). 381 (76.4%) participants were free of chronic diseases (Table 1).

In this study, headache (63.1%) was the most reported symptom after COVID-19 infection, followed by muscle ache or weakness (62.3%), vertigo (25%), concentration problems (21.8%), breathing troubles (20.4%), and loss of balance (19.4%). On the other hand, five cases of seizure (1%, four cases of intermittent seizure and one case of continuous seizure), and three cases of Guillain-Barre Syndrome (0.6%) have been documented and were the least common

| Variables | Frequency (n) | Percentage (%) |
|-----------|--------------|----------------|
| Gender    |              |                |
| Female    | 150          | 30.1           |
| Male      | 349          | 69.9           |
| Age       |              |                |
| Less than 45 years | 420 | 84.2          |
| 45 years or above | 79  | 15.8          |
| Region    |              |                |
| Western region | 405 | 81.2          |
| Other regions | 94   | 18.8          |
| Currently employed | 245 | 49.1          |
| Has no chronic diseases | 381 | 76.4          |
| Has chronic disease | 118 | 23.6          |
| Participants practicing exercises before COVID-19 infection | 275 | 55.1          |
| Participants did not practice any exercises before COVID-19 infection | 224 | 44.9          |
| Chronic diseases | 118 | 23.6          |
| Respiratory diseases | 42  | 8.4           |
| Cardiac diseases | 3   | 0.6           |
| Cancer     | 5            | 1.0            |
| Diabetes mellitus | 41  | 8.2           |
| Hypertension | 26  | 5.2           |
| Others     | 20           | 4.0            |
Many participants were suffering from more than one persistent symptom after COVID-19 infection, so the percentages were more than 100 percent (Table 2).

Certain symptoms, such as breathing problems and muscle discomfort or weakness, persisted after COVID-19 infection had cleared up in a median duration of 30 days and an interquartile range of 45 days. Regarding muscle pain, back muscles were the most affected (122 = 24.4%), followed by lower limb muscles (77 = 15.4%), neck muscles (30 = 6.0%), pelvic muscles (19 = 3.8%), and upper limb muscles (17 = 3.4%) (Table 3).

Many participants in this study showed a link between reported symptoms and certain physical activity performance after COVID-19 infection. Gender and physical activity performance were shown to have a significant relationship in 146 (29.3%) of participants (\(p = .001\)). There were 118 (80.8%) females and 28 (19.2%) males. There was a significant link between persistent symptoms’ impact on physical activity performance and respiratory disease (\(p = 0.017\)), with 330 (93.5) patients without respiratory diseases recording no persistent symptoms on physical performance and 127 (87.0) patients with respiratory diseases recording persistent symptoms on physical performance. No significant association was found between physical activity performance after COVID-19 infection and the habit of exercising before COVID-19 infection. 80 (54.8%) of the subjects had a habit of exercising before the infection, whereas 66 (45.2%) did not. Furthermore, 195 (55.2%) had a habit of exercising before the infection, which had no effect on their physical activity performances, while 158 (44.8%) had no habit of exercising before the infection and had no complaints of physical performance performances.

A majority of 353 participants (70.7%) do not record any association between persistent symptoms and certain physical activity performance, 231(65.4%) were females and 122 (34.6%) were males. Patients without hypertension had the highest comorbidity value of 337 (95.5%), followed by those without respiratory diseases (330 = 93.5%), non-diabetic patients (323 = 91.5%), diabetic patients (30 = 8.5%), patients with respiratory diseases (23 = 6.3%), and patients with hypertension (16 = 4.5%) (Table 4).

Additionally, participants who recorded persistent symptoms were asked to specify the frequency of symptoms. However, significant association was found between gender and frequency of symptoms (from 58 participants who recorded symptoms to be always persisting); females (47 = 81%) recorded higher frequency than males (11 = 19%), as shown in Table 5. Another significant association was discovered between respiratory disorders before infection and the prevalence of persistent symptoms, (\(p < 0.001\)). The findings showed that 280 (98.2%) of those who had no respiratory

### Table 2. Persistent symptoms after COVID-19 infection.

| Symptoms                        | Frequency (N = 499) | Percentage (%) |
|---------------------------------|---------------------|----------------|
| Headache                        | 315/499             | 63.1           |
| Muscle pain                     | 310/499             | 62.3           |
| Vertigo                         | 125/499             | 25.0           |
| Concentration problems          | 109/499             | 21.8           |
| Loss of balance                 | 97/499              | 19.4           |
| Seizure                         | 5/499               | 1.0            |
| Guillain Barre Syndrome         | 3/499               | 0.6            |

### Table 3. Muscle pain or weakness.

| Muscular pain                  | Frequency (N = 499) | Percentage (%) |
|--------------------------------|---------------------|----------------|
| Neck muscles                   | 30                  | 6.0            |
| Back muscles                   | 122                 | 24.4           |
| Upper limb muscles             | 17                  | 3.4            |
| Lower limb muscles             | 77                  | 15.4           |
| Pelvic muscles                 | 19                  | 3.8            |
| Other                          | 234                 | 46.9           |
disorders before COVID-19 infections had no symptoms after the infection, while 5 (1.8%) of those who had respiratory
diseases before COVID-19 infection had no symptoms after the infection.

Table 5 provided more information about the participants who reported the presence of symptoms occasionally while
performing everyday activities, 133 (85.3%) without respiratory diseases and 23 (14.7%) with respiratory diseases. Other
demographic data and comorbidities failed to reveal any statistically significant association between the impact and
physical activity (age, practicing exercises before infection).

Discussion
To our knowledge, this is the first study to evaluate the prevalence of musculoskeletal, neurological and physical disorder
after COVID-19 in the KSA adult population and their relationship with physical activities. The purpose of the current
study is to determine the prevalence of musculoskeletal, neurological, and physical health problems after COVID-19
infection, as well as how it affects the capability of daily life activities. Overall, this study found that musculoskeletal,
neurological, and physical activity were negatively affected after COVID-19 infection. This study involved

| Factor                                | Yes n (%) | No n (%) | p-value |
|---------------------------------------|-----------|----------|---------|
| Gender                                | 146 (29.3)| 353 (70.7)|         |
| Male                                  | 28 (19.2) | 122 (34.6)| 0.001   |
| Female                                | 118 (80.8)| 231 (65.4)|         |
| Age                                   |           |          |         |
| Less than 45 y/o                      | 117 (80.1)| 303 (85.8)| 0.113   |
| 45 y/o or older                       | 29 (19.9) | 50 (14.2) |          |
| Exercise before COVID-19 infection    |           |          |         |
| Yes                                   | 80 (54.8) | 195 (55.2)| 0.927   |
| No                                    | 66 (45.2) | 158 (44.8)|         |
| Comorbidities                         |           |          |         |
| Respiratory disease                   | 19 (13.0) | 23 (6.5)  | 0.017   |
| Non-respiratory disease               | 127 (87.0)| 330 (93.5)|         |
| DM                                    | 11 (7.5)  | 30 (8.5)  | 0.019   |
| Non-DM                                | 135 (92.5)| 323 (91.5)|         |
| HT                                    | 10 (6.8)  | 16 (4.5)  | 0.012   |
| Non-HT                                | 136 (93.2)| 337 (95.5)|         |

*p-value attained by chi-square test, DM: Diabetes mellitus, HT: Hypertension.
499 participants. According to demographic data, the percentage of women infected COVID-19 (349 = 69.9%) was higher than that of men (150 = 30.1%). This is different from a previous study in the KSA, in which the authors reported a higher prevalence among males than females. This is agreed with the percentage of total daily cases reported in the same study, in which male was decreased by 18.0%, compared to a 150% increase in females. Participants under 45 years old were also more impacted (420 = 84.2%) than those over 45 years old (79 = 15.8%), which matched the findings of a previous study (Alyami et al., 2020) that COVID-19 was more prevalent in adults than in children and elderslies. Our findings revealed that 275 persons (55.1%) had practiced physical activities before COVID-19 infection, which is higher than that reported by the General Authority for Statistics in 2019. This could be due to the larger sample size and increased awareness of the health benefits of physical activity among the Saudi population.

Low back pain was the most frequently recorded symptom among the participants after COVID-19 infection. The results are similar to those reported in a cross-sectional study conducted in Riyadh, Saudi Arabia with a sample of 463 participants. The reason for this is most likely owing to the detrimental impacts of quarantine for most nations during the Corona epidemic, as stated in a cross-sectional study done in Riyadh, Saudi Arabia with a sample size of 463 people. Sitting for long periods during quarantine may reduce lumbar muscle activity, which overloads the body’s passive tissues, such as intervertebral discs and ligaments. Furthermore, pain in the lower limb muscles was identified as the second most prevalent muscle pain in this study, which coincided with the previous study and could be due to the same reasons that produce low back pain. The presence of musculoskeletal manifestations in the current study findings could be explained by the fact that the Saudi Arabian government’s quarantine decree, as well as its strict implementation to ensure the preservation of public health for all people and the commitment of all people to it, which influenced the population’s lifestyle in terms of physical activity, dietary habits, and mental health. This phenomenon contributed to musculoskeletal problems, supported by multiple studies showing that physical activity rates were dramatically reduced, and food habits were negatively impacted following the lockdown. The high prevalence of muscle discomfort, particularly low back pain and other musculoskeletal complaints, may be explained by long hours of screen usage for work and education.

In this study, the impacts of COVID-19 on physical activity were recorded, and certain parameters such as gender and respiratory disease were found to be significantly related. The proportion of females who reported an impact on physical activity was 33.8%, compared to 18.67% of males (i.e., participants who declared that COVID-19 infection had a negative impact on their physical activity), like another finding, in which patient’s walking time was significantly reduced six months after the onset of persistent symptoms after COVID-19 infection. It could also be due to the muscle mass in male bodies and the fact that males, on average, engage in more physical exercise than females. Another viewpoint is that females are more likely to babysit and care for their children’s schooling, which has unquestionably altered substantially and become a bigger burden during COVID-19 pandemic, owing to quarantine and social isolation.

COVID-19 infection had a greater influence on physical activity among respondents with respiratory disease, which could lead to a negative impact on patients’ physical activity and cause further difficulties. However, more research is needed to confirm this link. Most people become sedentary as a result of the shift in lifestyle and the transformation of work and education to teleworking and tele-education. Impacts of COVID-19 was thoroughly documented in literature both locally and globally. Physical activity was found to be strongly affected by quarantine and course of disease in a systematic review of 15 publications. Furthermore, the reduction in physical activity after COVID-19 has a severe impact on people’s mental health and could lead to a variety of psychiatric problems.

During the COVID-19 pandemic, the prevalence of physical activity among participants was drastically reduced. Both active and inactive people became less active than they were before the lockdown. In Saudi Arabia, a survey-based study with 2,255 participants found comparable results, with more than half of respondents reporting a drop-in physical activity. However, the current study found a more significant link between COVID-19 infection and persistent symptoms in diabetic patients than non-diabetic patients, and in hypertension patients than patients without hypertension, which is supported by another study that found a higher prevalence of comorbidities with DM (68.3%), and hypertension (42.6%) after COVID-19 infection. As a result, patients with diabetes and chronic hypertension should be cautious about the long-term effects of COVID-19 infection on physical activity and muscular soreness after recovery.

Conclusion
COVID-19 had impacts on respiration, muscle strength, and daily activities. After COVID-19 infection, muscle ache and headache persisted in higher proportions than the other symptoms. Capability of daily activities was correlated to gender, respiratory diseases, diabetes, and hypertension.
Recommendation
Cohort studies with sufficient follow-up duration should be performed for more informative and precise results. Larger sample size will be needed in future studies for more generalized results.

Data availability

Underlying data
Figshare: Underlying data for ‘Prevalence of Musculoskeletal, Neurological and Physical Disorder After COVID-19 in Saudi Arabia: A Cross Sectional Study

The project contains the following underlying data:

Flow diagram of sample selection: 10.6084/m9.figshare.18585995

Tables: 10.6084/m9.figshare.18586016

Raw data: 10.6084/m9.figshare.18586034

STROBE-checklist for observational study: 10.6084/m9.figshare.19161485

Extended data
The project contains the following extended data:

Questionnaire: 10.6084/m9.figshare.19161620

Data are available under the terms of the Creative Commons Zero “No rights reserved” data waiver (CC0 1.0 Public domain dedication)

Acknowledgement
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References

1. Chan JF, Yuan S, Kok KH, et al.: A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. Lancet. 2020 Feb 15; 395(10223): 514-523. PubMed Abstract | Publisher Full Text | Free Full Text

2. Tabish SA: Tackling SARS-CoV-2 Pandemic: The Way Forward. Health. September 25, 2020; 12(9): 1202–1216. Publisher Full Text

3. Romero CNS, Colen HI, Godoy RME, et al.: Clinical signs and symptoms associated with COVID-19: a cross sectional study. International Journal of Odontostomatology. 2022; 16(1): 112–119. Publisher Full Text

4. Singhal T: A Review of Coronavirus Disease-2019 (COVID-19). Indian Journal of Pediatrics. 2020 Apr; 87(4): 281–286. PubMed Abstract | Publisher Full Text | Free Full Text

5. Šagát P, Bartík P, Prieto González P, et al.: Impact of COVID-19 Quarantine on Low Back Pain Intensity, Prevalence, and Associated Risk Factors among Adult Citizens Residing in Riyadh (Saudi Arabia): A Cross-Sectional Study. International Journal of Environmental Research and Public Health. 2020 Oct 6; 17(19): 7302. PubMed Abstract | Publisher Full Text | Free Full Text

6. Long-term effects of COVID-19: 2020, September 11. Reference Source

7. Marshall M: The lasting misery of coronavirus long-haulers. Nature. 2020, September 14; 585: 339–341. PubMed Abstract | Publisher Full Text

8. Alyami MH, Naser AY, Obaidi MA, et al.: Epidemiology of COVID-19 in the Kingdom of Saudi Arabia: An Ecological Study. Frontiers in Public Health. 2020 Sep 17; 8(8): 506. PubMed Abstract | Publisher Full Text | Free Full Text

9. Household Sports Practice Survey Bulletin 2019. General Authority for Statistics. 2019. Reference Source

10. Šagát P, Bartík P, Prieto González P, et al.: Impact of COVID-19 Quarantine on Low Back Pain Intensity, Prevalence, and Associated Risk Factors among Adult Citizens Residing in Riyadh (Saudi Arabia): A Cross-Sectional Study. International Journal of Environmental Research and Public Health. 2020 Oct 6; 17(19): 7302. PubMed Abstract | Publisher Full Text | Free Full Text

11. Abdullahi A, Candan SA, Abba MA, et al.: Neurological and Musculoskeletal Features of COVID-19: A Systematic Review and Meta-Analysis. Frontiers in Neurology. 2020 Jun 26; 11(1): 687. PubMed Abstract | Publisher Full Text | Free Full Text

12. Goërtz YMJ, Van Herck M, Delbressine JM, et al.: Persistent symptoms 3 months after a SARS-CoV-2 infection: the post-COVID-19 syndrome?. ERJ Open Research. 2020 Oct 26; 6(4): 00542-02020. PubMed Abstract | Publisher Full Text | Free Full Text

13. Violant-Holz V, Gallego-Jímenez MG, González-González CS, et al.: Psychological Health and Physical Activity Levels during the.
15. Wu K, Wei X: Analysis of Psychological and Sleep Status and Exercise Rehabilitation of Front-Line Clinical Staff in the Fight Against COVID-19 in China. Medical Science Monitor Basic Research.

16. Alguwaihes AM, et al.: Diabetes and Covid-19 among hospitalized patients in Saudi Arabia: a single-centre retrospective study. Cardiovascular Diabetology, [s. l.]. 2020; 19(1): 205–212.

COVID-19 Pandemic: A Systematic Review. International Journal of Environmental Research and Public Health. 2020 Dec; 17(24).
PubMed Abstract | Publisher Full Text | Free Full Text
Open Peer Review

Current Peer Review Status: ✓ ✓

**Version 3**

Reviewer Report 14 September 2024

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Camelia Pescaru
University of Medicine, Timișoara, Romania

No further comments to make.

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Areas of expertise: acute and chronic pulmonary diseases, such as COPD, Asthma, Sarcoidosis, Covid-19, Cystic fibrosis.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

**Version 2**

Reviewer Report 04 September 2023

https://doi.org/10.5256/f1000research.137299.r196018

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Camelia Pescaru
University of Medicine, Timișoara, Romania

In figure 1 it states that 2000 people were screened for eligible participation, however in the sampling part of the article, that number isn't referred to, nor does it say why 800 people were excluded, therefore it should mention the criteria of exclusion that leads to the 1200 people that
were randomly approached. If this was supposed to be understood from the Random selection of participants from different district in KSA, then also mention this number there and insert another box adjacent to it with the exclusion criteria (if it was randomly selected by a program) just like the other text boxes below.

Regarding citing the current literature, 15 of the 16 references are from the last 3-4 years, while reference number 3 is from 10 years ago, try looking for an alternative that is in the 2019-2022 range so that it matches with the rest of the references.

**Is the work clearly and accurately presented and does it cite the current literature?**  
Partly

**Is the study design appropriate and is the work technically sound?**  
Yes

**Are sufficient details of methods and analysis provided to allow replication by others?**  
Yes

**If applicable, is the statistical analysis and its interpretation appropriate?**  
Yes

**Are all the source data underlying the results available to ensure full reproducibility?**  
Partly

**Are the conclusions drawn adequately supported by the results?**  
Yes

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Areas of expertise: acute and chronic pulmonary diseases, such as COPD, Asthma, Sarcoidosis, Covid-19, Cystic fibrosis.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

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**Author Response 08 Sep 2023**

**Anwar Ebid**

Thank you for taking the time to review our submission, and for your valuable comments and nice words. Please find our detailed response to your comments below. All text in the manuscript has been added or changed.

**Authors reply to Comment # 1**

The methodology part has been revised, and the sampling section has been completely...
rewritten to describe the two stages of sample selection as the following:

- On a list of patients in the hospital database, 2000 participants were randomly selected for the first sample stage; however, 800 people had to be eliminated because of contact technical issues. The second stage involved approaching 1200 participants, but only 520 patients returned the questionnaire and 680 declined to participate. 21 respondents were excluded due to missing data. Finally, this study included 499 respondents.
- The updated sample selection flow diagram now includes the participant exclusion criteria.

Authors reply to Comment # 2

Reference No. 3 was replaced by a recent one (2022)

- Romero CNS; Colen HI; Godoy RME et al.: Clinical signs and symptoms associated with COVID-19: a cross-sectional study. *Int. J. Odontostomat.*, 16(1):112-119, 2022.

**Competing Interests:** No competing interests were disclosed.

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**Reviewer Report 01 August 2022**

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**Salah Abd Elmonem Sawan**

Department of Physical Therapy for Neuromuscular Disorder and its Surgery, Faculty of Physical Therapy, Cairo University, Giza, Egypt

The paper is valuable and it is clear, simple and with good sound but I have some questions and I need the answers from the authors:

1. **How could they assure that the link they sent for the patients was only for Saudi people?**
   i.e., Is it possible to provide the reader with a simple explanation of how to send the query to Saudis only, that is, how can you ensure that the link sent was answered by Saudis only because you made this query for Saudis only?

2. **How was the query carried out, and how were the questions added?** Have you hired a specialist to review the questions about the questionnaire? Was it approved and reviewed by a specialized authority? If you have, please add this to the paper in methodology section.
3. Was the survey (Questionnaire) provided in Arabic language or in another language?

4. Are there any further symptoms following COVID-19 were not mentioned at the paper?

5. Were there another symptoms specific to people who have been vaccinated against the Corona virus at this work?

Thank you.

Dr Salah Sawan

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Physical therapy and movements disorders

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 09 Aug 2022

**Anwar Ebid**

Dear Professor, Salah Sawan

Thank you so much for your comments.

The authors are grateful for the reviewers' voluntary contributions in the form of insightful comments that have assisted us in improving our manuscript.
The authors have made every effort to revise the manuscript in response to your comments.

In response to your suggestions, we have published an updated version of this article.

Please consider these new versions to be the revised version of this article.

Thank you very much.

Regards,

Authors

The paper is valuable and it is clear, simple, and with good sound but I have some questions and I need the answers from the authors:

1. How could they assure that the link they sent for the patients was only for Saudi people? i.e., Is it possible to provide the reader with a simple explanation of how to send the query to Saudis only, that is, how can you ensure that the link sent was answered by Saudis only because you made this query for Saudis only?

   Reply: The King Abdullah International Medical Research Center (KAIMRC) was in responsible of selecting Saudi participants at random using a filing system and distributing the questionnaire via WhatsApp.

2. How was the query carried out, and how were the questions added? Have you hired a specialist to review the questions about the questionnaire? Was it approved and reviewed by a specialized authority? If you have, please add this to the paper in the methodology section.

   Reply: The research team first prepared the query, which was then sent to two different Arabic specialists to modify and correct any Arabic errors before being sent to a documented English translation office to prepare the final version of the questionnaire. It was reviewed by the ethical committee in The King Abdullah International Medical Research Center (KAIMRC). The questionnaire was submitted as a preliminary sample to see if there were any issues with it. The response was added to the methodology section.

3. Was the survey (Questionnaire) provided in Arabic language or in another language?

   Reply: Yes: The survey was provided in Arabic and English version after reviewing by specialists, also it was reviewed by the ethical committee in The King Abdullah International Medical Research Center (KAIMRC)

4. Are there any further symptoms following COVID-19 were not mentioned at the paper?

   Reply: All symptoms following COVID-19 mentioned with the respondent were
5. Were there another symptoms specific to people who have been vaccinated against the Coronavirus at this work?

**Reply No:** There were no symptoms specific to people who had been vaccinated against the Coronavirus at this work. The questionnaire was only used to assess and collect symptoms after Covid-19, and we did not test for vaccine effect.

**Competing Interests:** NO competing interest