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Determination of Post-COVID-19 Symptoms Among Recovered Cases in Iraqi Kurdistan Region: A Cross-Sectional Study

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Abstract

Objective: The current study aimed to investigate post-Covid-19 symptoms and it is associated factors in Kurdistan region, Iraq. Methods: A cross-sectional study conducted among the general population. The study included 454 recovered COVID-19 patients; the questionnaire consists of four parts; starting from socio-demographic data, Items about the acute and post-COVID-19 status, and other comorbidities of the individuals. Quality of life was measured by EQ-5D Visual Analogue Scale and finally, WHO severity scales were used to assess Covid-19 conditions. Data were analyzed in the form of descriptive statistics and using SPSS version 24.0 (IBM Corp., Armonk, NY, USA). Results: The vast majority (75.6%) experienced post-symptoms for about 3 months or less. Post Covid-19 was found to be significantly ($p < 0.05$) related to gender, quality of life, and duration of symptoms. Common symptoms were fatigue 203 (44.7%), Myalgia 99 (21.8%), Sleep disturbance 84 (18.5%), Anosmia and Headache 65(14.3), and 64 (14.1) respectively. Nonetheless, we also observed a significant association between disease severity and the number of acute symptoms with post-COVID-19 symptoms. Conclusion: The bulk of the study's survivors reported experiencing post-COVID-19 symptoms. As a result, there is a critical requirement for evaluation and rehabilitation following the recovery, thus careful coordination between COVID-19 healthcare facilities and public hospitals is needed.

Keywords
Covid-19, post-acute Covid-19, Disease Severity, Quality of life, Kurdistan region, Iraq

Coronavirus disease 2019 [COVID-19] is a severe respiratory disease caused by a novel coronavirus that was discovered in late 2019 (SARS-CoV-2) [1]. COVID-19 was classified as a pandemic disease by the World Health Organization on March 11, 2020 [2]. As of 23

December 2021, there were a total of 380,017 confirmed cases, 370,560 recovered, and 7,083 deaths in the Kurdistan region [3]. COVID-19 is a heterogeneous virus that manifests itself with a wide spectrum of symptoms, from asymptomatic to life-threatening and fatal diseases [4,5]. Most of the infected patients completely recover after the COVID-19 infection. However, a substantial proportion of patients continue to have symptoms long past the time that they recovered from the initial phases of COVID-19 disease [6].

A constellation of persistent symptoms has been seen in survivors of previous coronavirus infections, such as the SARS epidemic of 2003 and the Middle East respiratory disease (MERS) outbreak of 2012, indicating caution for clinically severe COVID-19 aftereffects [7]. Post-acute COVID-19 is defined as a condition in which the disease manifestations are extended beyond three weeks since the onset of symptoms including fatigue, anosmia, headache, and cough [8]. The mechanisms behind these symptoms are not very well understood [9], but they are more common in people with post-ICU syndrome, post-viral fatigue syndrome, permanent organ damage, and others, which could cause post-COVID syndrome [10].

Even though Post covid-19 was assumed to be limited to hospital survivors at first, it is now clear that the majority of instances are documented even in those who were not hospitalized or who did not seek medical help right away [11,12].

Furthermore, patients with severe acute respiratory syndrome (SARS) experienced significant reductions in their overall quality of life [13]. Post-acute COVID-19 emphasizes the significance of patient care since the symptoms can have a considerable influence on day-to-day activities and the improvement of knowledge regarding the typical course of a COVID-19 disease [14]. Many studies examining the presence of post-COVID-19 symptoms have been published recently. Research conducted on hospitalized patients in Basra, Iraq, and followed up days to weeks following their recovery, revealed that about 62.3% of survivors experienced post-COVID-19 symptoms [15]. More specifically and for better understanding of survived cases of COVID-19, the current study aims to assess post-Covid-19 symptoms and it is associated factors among Kurdish population.

Methods

Study design and participants

To enroll people from Iraq's Kurdistan region (Hawler, Duhok, and Sulaymaniyah), a cross-sectional study design was conducted. It took an average of 10 minutes to answer all of the questions that were collected between September 15, 2021, and December 15, 2021. Survey Monkey® was used to conduct an English-Arabic-Kurdish questionnaire designed by the researchers and submitted online. To reach participants across Iraqi Kurdistan's three governorates, the questionnaires were sent by email and social media platforms including Viber, Facebook, Messenger, and what's App. Pages and groups of different sorts were employed, namely (political, medical, public, music, poetries, psychiatric, teachers, students, governmental employees, and private sectors). In addition, the authors visited major public places, individually inviting people to take part in the research. The researchers recruited the vast majority of their subjects by conducting face-to-face interviews. They visit a variety of locations, including restaurants, hospitals, retail malls, universities, and public roads, to get a more accurate population. So that older adults who do not use social media or persons who are illiterate will have an equal opportunity to participate in the study. Each participant's informed consent was obtained after being made aware of the study's aim and objectives.

Tools of study

The questionnaire was developed based on a comprehensive study of the literature review from earlier research with common objectives [16,17].

The questionnaire was divided into four main parts. Part one was related to the socio-demographic characteristics of the sample, which include gender, age, marital status, smoking, alcohol use, height, and weight. The second part consists of items related to acute

and post-COVID-19 characteristics and manifestations for example (Receiving vitamins during Covid-19, whether having a chronic disease or not, duration of experiencing Post-Covid-19 symptoms, acute and persistent symptoms, where you take medication during covid-19, etc.). The EQ-5D Visual Analogue Scale (EQ-5D VAS) was used to ask individuals to indicate their overall health status before and after the Covid-19 period on a vertical visual analog scale, which ranges from (0), which indicates the worst health, to (100), which indicates the highest health as a third part of the questionnaire. WHO COVID-19 technical guidelines were used to classify the severity of the COVID-19 disease as mild to moderate, severe, and critical as a fourth part [18].

Inclusion and Exclusion criteria

Participants included in this study declared that they have been diagnosed with COVID-19 before the time of the questionnaire. Also, only Kurds who were at least 18 years and older and had the mental competence to give their consent and participate in face-to-face and online interviews were allowed to participate in the study. The exclusion criteria also included those who declined to take part in the study and those who did not answer a few questions.

Sample size

The sample size was determined using Cochrane's formula [19]. According to the cross-sectional study's criteria in the Cochran equation, The Z is 1.96 for the normal distribution, p for a large population 0.50 was expected post-COVID-19 cases, q was non-infected persons by the COVID-19, and was the 0.05 acceptable margin of error. 384 patients from general population were the required sample size for this study. The sample size was increased by 18% to compensate for missing information and the rejection rate.
The sample was increased by 18%, 384*0.18= 69.12 (rounded to 70), 384+70=454 final sample size.

Ethical Considerations

The authors received ethical approval from Duhok Polytechnic University and the local health ethics committee of the Duhok General Directorate of Health (reference number 24102021-10-19). Informed consent was also obtained from study participants, who were assured that their personal information was kept confidential throughout the study.

Statistical analyses

The demographic data were analyzed through descriptive statistics (Percent, frequency). Factors were analyzed through a chi-square test to determine significant values. T-test was used to compare the group of participants having or not having post-COVID-19 symptoms. P-values (statistical significance $p < 0.05$, highly significant $p < 0.001$) were determined. Version 23 of IBM SPSS Statistics was used (IBM Corporation, Armonk, New York, USA).

Results

Table 1 shows that the post-recovery symptoms presented in different categories of socio-demographic data without any significant differences ($P>0.05$). The socio-demographic data included the categories of age, gender, marital status, height, weight, smoking, alcohol drinking habits, comorbidities, and whether or not to receive COVID-19 vaccines.
This table also shows that the duration of post-recovery symptoms has a significant association with the presence of post-recovery symptoms ($p<0.001$). Additionally, the health status of participants before getting COVID-19 infection was better among those who did not develop post-recovery symptoms of COVID-19 M (SD)= 84.31 (18.658) which is higher than those who developed post-recovery symptoms after that M (SD)= 78.94 (17.857), t=2.941, de=452, p=0.004. The same significant findings appeared with the health status of participants in the period of post-COVID-19 infection. Those who did not develop post-recovery symptoms had a better mean of a healthy status M (SD)= 81.51 (20.330) compared to those who did not develop post-recovery symptoms M (SD)= 73.87

(19.323), t=3.843, df=452, P<0.001.

Table 1: Post-COVID-19 Symptoms according to patients' baseline characteristics (N=454).

Demographic characteristics	Post recovery symptoms		X^2/t	df	P-value
	Yes (N=306)	No (N=142)			
Age			3.907[a]	2	0.121
<40 years	232 (74.4)	115 (81)			
40-64 years	74 (23.7)	27 (19)			
≥65years	6 (1.9)	0 (0)			
Gender			3.949	1	0.054
Female	161 (51.6)	59 (41.5)			
Male	151 (48.4)	83 (58.5)			
Marital status			5.467[a]	3	0.092
Single	103 (33)	61 (43)			
Married	203 (65.1)	81 (57)			
Divorced	2 (0.6)	0 (0)			
Widow	4 (1.3)	0 (0)			
Height			1.291[a]	2	0.537
<150 cm	4 (1.3)	1 (0.7)			
150-169 cm	160 (52.5)	67 (47.5)			
≥170 cm	141 (46.2)	73 (51.8)			
Weight			0.133	3	0.981
<50 Kg	11 (3.6)	6 (4.3)			
50-74 Kg	167 (55.1)	78 (55.3)			
75-99 Kg	119 (39.3)	54 (38.3)			
≥100 Kg	6 (2)	3 (2.1)			
Smokers	59 (18.9)	24 (16.9)	0.264	1	0.695
Alcohol drinkers	15 (4.8)	9 (6.3)	0.456	1	0.652
Significant Comorbidities			4.186[a]	4	0.375
0	267 (85.6)	131 (92.3)			
1	35 (11.2)	9 (6.3)			
2	8 (2.6)	2 (1.4)			
≥3	2 (0.6)	0 (0)			
Received COVID-19 vaccine			1.126	2	0.583
Not vaccinated	144 (46.2)	59 (41.5)			
Vaccinated	168 (53.8)	83 (58.5)			
Duration of post recovery symptoms			21.134	2	<0.001
≤3 months	236 (75.6)	133 (93.7)			
>3 months	16 (5.1)	3 (2.1)			
Health status (EQ-VAS) pre COVID-19 M(SD)	78.94 (17.857)	84.31 (18.658)	2.931	452	0.004
Health status (EQ-VAS) post Covid-19 M(SD)	73.87 (19.323)	81.51 (20.330)	3.843	452	<0.000
X2Chi square test, a Fisher's Exact Test, df is a degrees of freedom, P>0.05 shows significant association.					

Table 2 demonstrates the percentages of COVID-19 acute symptoms and post-recovery symptoms among the participants. The most common symptoms of COVID-19 during the acute infection, were fatigue (83.7%), fever (77.1%), myalgia (69.4%), headache (63%), and anosmia (55.5%) respectively. To some degree differently, the most common post-recovery symptoms were fatigue (44.7%), myalgia (21.8%), sleep disturbances (18.5%), anosmia (14.3%), and headache (14.1%) respectively.

Table 2: Covid-19 symptoms and post recovery symptoms among the participants

Symptoms	Acute COVID-19 symptoms n (%)	Post recovery symptoms n (%)
Fever	350 (77.1)	18 (4)
Cough	233 (51.3)	40 (8.8)
Dyspnea	103 (22.7)	32 (7)
Chest pain	103 (22.7)	22 (4.8)
Headache	286 (63)	64 (14.1)
Myalgia	315 (69.4)	99 (21.8)
Fatigue	380 (83.7)	203 (44.7)
Sleep disturbances	249 (54.8)	84 (18.5)
Anosmia	252 (55.5)	65 (14.3)
Ageusia	236 (52)	42 (9.3)
Gastrointestinal symptoms	123 (27.1)	18 (4)

Table 3 reports the association of acute COVID-19 infection symptoms to the rate of post-Covid-19 symptoms among the participants who developed post-recovery symptoms (n=306). The

acute COVID-19 symptoms which have a significant association with the development of post-recovery symptoms were cough (75.5%), dyspnoea (81.6%), headache (73.1%), and myalgia (73.7%). About 72.6% and 76.7% of participants experienced post-COVID-19 symptoms in those having fatigue or sleep disturbances respectively during acute infection. The associations seem to be highly significant statistically ($p<0.001$). The acute COVID-19 symptoms which do not show significant association with post-recovery symptoms were fever, chest pain, anosmia, ageusia, and gastrointestinal symptoms ($p<0.05$).

Table 3: Association of acute COVID-19 symptoms to the rate of post COVID-19 symptoms

Acute COVID-19 Symptoms	Post COVID symptoms		X^2	df	P-value
	Yes (N=306)	No (N=142)			
Fever	244 (69.7)	106 (30.3)	0.699	1	0.470
Cough	176 (75.5)	57 (24.5)	10.339	1	0.002
Dyspnea	84 (81.6)	19 (18.4)	12.204	1	0.002
Chest pain	76 (73.8)	27 (26.2)	1.589	1	0.228
Headache	209 (73.1)	77 (26.9)	6.818	1	0.012
Myalgia	232 (73.7)	83 (26.3)	11.626	1	0.001
Fatigue	276 (72.6)	104 (27.4)	16.574	1	<0.001
Sleep disturbances	191 (76.7)	58 (23.3)	16.355	1	<0.001
Anosmia	178 (70.6)	74 (29.4)	0.964	1	0.360
Ageusia	165 (69.9)	71 (30.1)	0.325	1	0.613
Gastrointestinal symptoms	93 (75.6)	30 (24.4)	3.723	1	0.068
X^2Chi square test, [a] Fisher's Exact Test, df is a degrees of freedom, P>0.05 shows significant association.					

Table 4 shows the Association of clinical presentations to the percentages of post-Covid-19 symptoms among the participants (n=306). The severity of acute COVID-19 symptoms was significantly associated with the rate of post-Covid-19 symptoms. Those who developed asymptomatic or mild to moderate severity acute COVID-19 infection were less likely to present with post-COVID symptoms (4.2% and 81.7%) compared to those who do not develop post-COVID symptoms (7% and 87.3% respectively). The severe and critical status of acute COVID-19 infection was associated with a higher rate of post- COVID-19 symptoms (12.4% and 1.6%) compared to those who do not develop post-recovery symptoms (5.6% and 0% respectively. The number of acute COVID-19 symptoms was also highly significantly associated with the rate of post-COVID-19 symptoms. The higher number of acute symptoms the higher percentage of post-COVID-19 symptoms. Those who have 5 acute COVID-19 symptoms or more had a higher rate of developing post-COVID-19 symptoms (73.7%).

Table 4: Post-COVID-19 symptoms according to the clinical presentation (n=454)

Clinical presentation	Post COVID-19 symptoms		X^2	df	P-value
	Yes (N=306)	No (N=142)			
Acute COVID-19 severity			8.290[a]	3	0.033
Asymptomatic	13 (4.2)	10 (7)			
Mild-moderate	250 (81.7)	124 (87.3)			
Severe	38 (12.4)	8 (5.6)			
Critical	5 (1.6)	0 (0)			
Number of acute symptoms			38.739	5	<0.001
0	8 (2.6)	3 (2.1)			
1	2 (0.6)	12 (8.5)			
2	12 (3.8)	14 (9.9)			
3	27 (8.7)	23 (16.2)			
4	33 (10.6)	18 (12.7)			
≥5	230 (73.7)	72 (50.7)			
Management			3.670	3	0.303
At home without physician	158 (50.6)	84 (59.2)			
Out patient	133 (42.6)	48 (33.8)			
In patient	11 (3.5)	4 (2.8)			
None of the above	10 (3.2)	6 (4.2)			
Receiving vitamins during acute infection			2.680	1	0.066
Yes	244 (78.2)	101 (71.1)			
No	68 (21.8)	41 (28.9)			
X^2Chi square test, [a] Fisher's Exact Test, df is a degrees of freedom, P>0.05 shows significant association.					

Furthermore, the place and way of management of acute COVID-19 infection were not associated significantly with the presence of post-recovery symptoms ($p>0.05$). And interestingly, receiving vitamins during acute infection was also not associated significantly with the presence of post-COVID-19 symptoms

Discussion

The post-Covid-19 period in Kurdistan region is poorly understood, for this reason, we studied Post COVID-19 symptoms in 454 infected individuals who decelerated and experienced symptoms in the acute infection phase. Studies Found 13.3% to 96% of participants had persistent symptoms. Differences in reported results could be attributed to research population (inpatients/outpatients, infection severity), study methods (patient self-reporting, questionnaire type, outpatient clinic/inpatients discharged), and the period following infection [17].In the present study, post-COVID-19 symptoms were recorded for about 67.4% of the recovered cases. In line with other studies, our finding showed that the proportion of post-COVID-19 symptoms was higher among females than males. Similarly, the presence of COVID-19 onset symptoms and long-term post-COVID symptoms was also associated with female sex, according to multi-center cohort research [20]. Gender differences should be taken into consideration when managing individuals who have recovered from COVID-19 and experience post-COVID sequelae [21]. However, we did not find any association between age and having comorbidities with post-covid-19 symptoms [22]. One reason could be that Post covid-19 symptoms persist even among young and healthy individuals. Another reason was that the majority of participants had no comorbidities. In contrast to our result, other studies found a significant association [23,24]. Also, we found that the majority of survivors experienced symptoms for three months or less. Similarly, a systematic review that included 31 papers found that COVID-19 sequelae persist for 14 days to three months [18]. According to other studies, symptoms can last for 6 to 12 months and up to 1 year [25,26]. It is unknown why certain COVID-19 individuals have longer symptoms. However, viral dosage and host-dependent variables, such as genetic factors or anti-inflammatory cell and protein activation, can affect infection outcomes [27].

However, during the acute phase of Covid-19, its impact on Quality of life has already been reported [28]. We asked individuals to assess their health status both during and post the Covid-19 pandemic. During the post-phase, we discovered that the overall mean quality of life worsened and was significantly associated with symptoms. Multiple studies have assessed the persistence of poor quality-of-life symptoms after COVID-19 [27,29].

Consistent with our findings, other studies have found that fatigue is the most common post-COVID-19 symptom [30,31]. Other common symptoms were myalgia sleep disturbance Anosmia and headache these results match those of a study in Saudi Arabia [18]. Also, consistent with those of other research [32], some symptoms, such as dyspnea, chest pain, myalgia, cough, etc., were more prevalent than others [33,34].In alignment with a large systematic review and a follow-up research conducted in Italy, fewer symptoms of gastrointestinal problems, fever, chest discomfort, cough, and dyspnea were reported in the post-covid-19 period [16,35].

In particular, we revealed a high correlation ($P>0.05$) between acute phase symptoms (fatigue, myalgia, sleep disturbance, cough, etc.) that lasted long after recovery than other symptoms. This highlighted that certain symptoms may subside gradually and requires time to fully heal, while others are time-related and recover after infection. A cross-sectional study with 158 recovered patients by Iqbal et al. reported that there was no correlation between time since recovery and some post-COVID-19 symptoms [36].

The study found that the disease severity and post-COVID-19 symptoms were significantly related. Larijani et al. a very recent cohort study found that Iranian participants with severe COVID-19 had more severe post-recovery symptoms than those with mild to moderate disease [37], additional evidence is provided [23]. Interestingly, also statistically significant ($p>0.001$) association between the numbers of acute symptoms with post-recovery symptoms

were observed. Our findings are consistent with those of Peghin et al., also observed that some early symptoms are linked to long COVID, highlighting that it could be a substantial risk factor for SARS-CoV-2 long manifestation [16]. Similar results have also been shown by a study done in Iran [37]. In addition, a severe type of COVID-19 typically results from experiencing more symptoms in the early stages of the illness, which activates a significant immune response and cytokine production. So it makes sense to expect increased organ damage that will require extensive care and treatment and may cause long-term complications (25).

Limitations

First, because this study is cross-sectional, this type of design provides a snapshot of post-COVID-19 symptoms at one specific time. So a follow-up study with diagnosed test results such as PCR may strengthen the results of the current study. Secondly, this study is based on a questionnaire of self-reported symptoms from survivors, which could introduce selection bias. Thirdly, we surveyed patients to find out how severe their symptoms were still in the acute stage. As a result, there could be gaps in how severely patients report their symptoms.

Conclusion

The majority of survivors in this cross-sectional study had post-COVID-19 symptoms. The most prevalent symptoms were fatigue, myalgia, and sleep disturbance. Female gender, duration of recovery, and the severity of the acute phase were significantly related to post-covid-19. Moreover, rehabilitation and management are essential for maintaining a good quality of life after acute recovery.

Disclaimer

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Conflict of interest

None

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References

Karthik, L., Kumar, G., Keswani, T., Bhattacharyya, A., Chandar, S. S., & Bhaskara Rao, K. V. (2014). Protease inhibitors from marine actinobacteria as a potential source for antimalarial compound. PloS one, 9(3), e90972.

World Health Organization. (2020). Responding to community spread of COVID-19: interim guidance, 7 March 2020 (No. WHO/COVID-19/Community_Transmission/2020.1). World Health Organization.

Coronavirus (COVID-19) dashboard: Information and advice-GOV.KRD. Available at https://gov.krd/coronavirus-en/dashboard/.

Auzzir, Z. A., Haigh, R. P., & Amaratunga, D. (2014). Public-private partnerships (PPP) in disaster management in developing countries: a conceptual framework. Procedia economics and finance, 18, 807-814.

Chen YT, Shao SC, Hsu CK,Wu IW, Hung MJ, Chen YC. Incidence of acute kidney injury in COVID-19 infection: a systematic review and meta-analysis. Crit Care. (2020) 24:346. doi: 10.1186/s13054-020-03009-y.

Hui, D. S., Joynt, G. M., Wong, K. T., Gomersall, C. D., Li, T. S., Antonio, G., ... & Sung, J. J. Y. (2005). Impact of severe acute respiratory syndrome (SARS) on pulmonary function, functional capacity and quality of life in a cohort of survivors. Thorax, 60(5), 401-409.

Ahmed, H., Patel, K., Greenwood, D. C., Halpin, S., Lewthwaite, P., Salawu, A., ... & Sivan, M. (2020). Long-term clinical outcomes in survivors of severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome coronavirus (MERS) outbreaks after hospitalisation or ICU admission: a systematic review and meta-analysis. Journal of rehabilitation medicine, 52(5), 1-11.

Anjana, N. K. N., Annie, T. T., Siba, S., Meenu, M. S., Chintha, S., & Anish, T. S. N. (2021). Manifestations and risk factors of post COVID syndrome among COVID-19 patients presented with minimal symptoms−A study from Kerala, India. Journal of Family Medicine and Primary Care, 10(11), 4023.

Malik, P., Patel, K., Pinto, C., Jaiswal, R., Tirupathi, R., Pillai, S., & Patel, U. (2022). Post-acute COVID-19 syndrome (PCS) and health-related quality of life (HRQoL)—A systematic review and meta-analysis. Journal of medical virology, 94(1), 253-262.

Cortinovis, M., Perico, N., & Remuzzi, G. (2021). Long-term follow-up of recovered patients with COVID-19. The Lancet, 397(10270), 173-175.

Lopez-Leon, S., Wegman-Ostrosky, T., Perelman, C., Sepulveda, R., Rebolledo, P. A., Cuapio, A., & Villapol, S. (2021). More than 50 long-term effects of COVID-19: a systematic review and meta-analysis. Scientific reports, 11(1), 1-12.

Moreno-Рйrez, O., Merino, E., Leon-Ramirez, J. M., Andres, M., Ramos, J. M., Arenas-Jimйnez, J., ... & COVID19-ALC research group. (2021). Post-acute COVID-19 syndrome. Incidence and risk factors: A Mediterranean cohort study. Journal of Infection, 82(3), 378-383.

Rogers, J. P., Chesney, E., Oliver, D., Pollak, T. A., McGuire, P., Fusar-Poli, P., ... & David, A. S. (2020). Psychiatric and neuropsychiatric presentations associated with severe coronavirus infections: a systematic review and meta-analysis with comparison to the COVID-19 pandemic. The Lancet Psychiatry, 7(7), 611-627.

van Kessel, S. A., Olde Hartman, T. C., Lucassen, P. L., & van Jaarsveld, C. H. (2022). Post-acute and long-COVID-19 symptoms in patients with mild diseases: a systematic review. Family practice, 39(1), 159-167.

Yousif, I. I., Hashim, A. R., & Farid, H. A. (2021). The clinical manifestation of post COVID-19 syndrome among Basra city population-southern of Iraq. Annals of the Romanian Society for Cell Biology, 5867-5873.

Peghin, M., Palese, A., Venturini, M., De Martino, M., Gerussi, V., Graziano, E., ... & Tascini, C. (2021). Post-COVID-19 symptoms 6 months after acute infection among hospitalized and non-hospitalized patients. Clinical Microbiology and Infection, 27(10), 1507-1513.

Garout, M. A., Saleh, S. A., Adly, H. M., Abdulkhaliq, A. A., Khafagy, A. A., Abdeltawab, M. R., ... & Alandiyjany, M. N. (2022). Post-COVID-19 syndrome: assessment of short-and long-term post-recovery symptoms in recovered cases in Saudi Arabia. Infection, 1-9.

Ayoubkhani, D., Khunti, K., Nafilyan, V., Maddox, T., Humberstone, B., Diamond, I., & Banerjee, A. (2021). Post-covid syndrome in individuals admitted to hospital with covid-19: retrospective cohort study. BMJ 372: n693.

Cochran WG. Sampling techniques. 3rd ed. New Jersey: Wiley; 2007.

Fernбndez-de-Las-Pecas, C., Martнn-Guerrero, J. D., Pellicer-Valero, У. J., Navarro-Pardo, E., Gymez-Mayordomo, V., Cuadrado, M. L., ... & Arendt-Nielsen, L. (2022). Female sex is a risk factor associated with long-term post-COVID related-symptoms but not with COVID-19 symptoms: The LONG-COVID-EXP-CM multicenter study. Journal of clinical medicine, 11(2), 413.

Gebhard, C., Regitz-Zagrosek, V., Neuhauser, H. K., Morgan, R., & Klein, S. L. (2020). Impact of sex and gender on COVID-19 outcomes in Europe. Biology of sex differences, 11(1), 1-13.

Carvalho-Schneider, C., Laurent, E., Lemaignen, A., Beaufils, E., Bourbao-Tournois, C., Laribi, S., ... & Bernard, L. (2021). Follow-up of adults with noncritical COVID-19 two months after symptom onset. Clinical Microbiology and Infection, 27(2), 258-263.

Kamal, M., Abo Omirah, M., Hussein, A., & Saeed, H. (2021). Assessment and characterisation of post-COVID-19 manifestations. International journal of clinical practice, 75(3), e13746.

Hussein, A. A. M., Saad, M., Zayan, H. E., Abdelsayed, M., Moustafa, M., Ezzat, A. R., ... & Sayed, I. (2021). Post-COVID-19 functional status: Relation to age, smoking, hospitalization, and previous comorbidities. Annals of Thoracic Medicine, 16(3), 260.

Asadi-Pooya, A. A., Akbari, A., Emami, A., Lotfi, M., Rostamihosseinkhani, M., Nemati, H., ... & Shahisavandi, M. (2021). Risk factors associated with long COVID syndrome: a retrospective study. Iranian Journal of Medical Sciences, 46(6), 428.

Zhou, F., Tao, M., Shang, L., Liu, Y., Pan, G., Jin, Y., ... & Yang, S. (2021). Assessment of sequelae of COVID-19 nearly 1 year after diagnosis. Frontiers in Medicine, 8.

SeeЯle, J., Waterboer, T., Hippchen, T., Simon, J., Kirchner, M., Lim, A., ... & Merle, U. (2022). Persistent symptoms in adult patients 1 year after coronavirus disease 2019 (COVID-19): a prospective cohort study. Clinical infectious diseases, 74(7), 1191-1198.

Algahtani, F. D., Hassan, S. U. N., Alsaif, B., & Zrieq, R. (2021). Assessment of the quality of life during COVID-19 pandemic: a cross-sectional survey from the Kingdom of Saudi Arabia. International journal of environmental research and public health, 18(3), 847.

Fцrster, C., Colombo, M. G., Wetzel, A. J., Martus, P., & Joos, S. (2022). Persisting Symptoms After COVID-19. Deutsches Aerzteblatt International, 119(10).

Jassat, W., Mudara, C., Vika, C., Welch, R., Arendse, T., Dryden, M. T. G., ... & Cohen, C. (2022). A cohort study of Post COVID-19 Condition across the Beta, Delta and Omicron waves in South Africa: 6-month follow up of hospitalised and non-hospitalised participants. medRxiv.

Tosato, M., Carfм, A., Martis, I., Pais, C., Ciciarello, F., Rota, E., ... & Team, P. A. C. (2021). Prevalence and predictors of persistence of COVID-19 symptoms in older adults: a single-center study. Journal of the American Medical Directors Association, 22(9), 1840-1844.

Jacobs, L. G., Gourna Paleoudis, E., Lesky-Di Bari, D., Nyirenda, T., Friedman, T., Gupta, A., ... & Aschner, J. L. (2020). Persistence of symptoms and quality of life at 35 days after hospitalization for COVID-19 infection. PloS one, 15(12), e0243882.

Carfм, A., Bernabei, R., Landi, F., & Gemelli Against COVID-19 Post-Acute Care Study Group (2020). Persistent Symptoms in Patients After Acute COVID-19. JAMA, 324(6), 603–605. https://doi.org/10.1001/jama.2020.12603

Daher, A., Balfanz, P., Cornelissen, C., Mьller, A., Bergs, I., Marx, N., ... & Mьller, T. (2020). Follow up of patients with severe coronavirus disease 2019 (COVID-19): Pulmonary and extrapulmonary disease sequelae. Respiratory medicine, 174, 106197.

Nguyen, N. N., Hoang, V. T., Dao, T. L., Dudouet, P., Eldin, C., & Gautret, P. (2022). Clinical patterns of somatic symptoms in patients suffering from post-acute long COVID: a systematic review. European Journal of Clinical Microbiology & Infectious Diseases, 1-31.

Iqbal, A., Iqbal, K., Ali, S. A., Azim, D., Farid, E., Baig, M. D., ... & Raza, M. (2021). The COVID-19 sequelae: a cross-sectional evaluation of post-recovery symptoms and the need for rehabilitation of COVID-19 survivors. Cureus, 13(2).

Larijani, M. S., Ashrafian, F., Amiri, F. B., Banifazl, M., Bavand, A., Karami, A., ... & Ramezani, A. (2022). Characterization of long COVID-19 manifestations and its associated factors: A prospective cohort study from Iran. Microbial Pathogenesis, 105618.