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Effect of prostrate position and coughing exercises upon level of dyspnea and persistent cough among non-intubated patients with COVID-19

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***Abstract*---**Background: The Novel Coronavirus Disease (COVID-19) causes clinical symptoms ranging in severity. Dyspnea and coughing are determined as one of the most significant problems. This study aimed to investigate the effect of prostrate position and coughing exercises upon dyspnea and persistent cough levels among non-intubated patients with COVID-19. Method: An experimental study design was carried out in the COVID-19 wards in Imam Al-Hussein Medical City, from the period of October 2021 to March 2022. Results: More than 60% of the patients were elderly, 60% of the experimental group was male, and 53.3% of the control group was female, it is very useful to use prostrate position and coughing exercises to facilitate breathing patterns and decrease the severity of the cough. Conclusion: The prostration position and coughing exercises are very useful in improving gas exchange and relieving the severity of dyspnea and coughing in patients with COVID-19. In addition, this positive effect lasted for more than four hours of implementing the interventional protocol. Recommendations: Performing a prostrate position and coughing exercises one hour every four hours for patients with COVID-19 suffering from dyspnea and persistent cough.

***Keywords*---**prostrate, position, coughing exercises, dyspnea, cough, COVID-19.

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Introduction

The novel coronavirus disease 2019 or COVID-19 as described by the World Health Organization (WHO) is disease-causing a respiratory infection by a severe acute respiratory syndrome-related coronavirus (SARS-CoV) (Kurtaiş Aytür, et al., 2021). According to the WHO, viral infections are still emergent transmitted diseases, and on 30th January 2020, the WHO Emergency Committee asserted this disease as an emergency health issue globally (Faris, et al., 2021). Since the Corona pandemic began to spread to all countries of the world, it is continued to rise numbers until the 22nd of February 2022 reaching more than 422,000,000 confirmed cases, of which approximately 5,800,000 deaths, or 1.37%. And 416,200,000 cured cases, or 98.6.2% (World Health Organization, 2022). In Iraq, the number of confirmed cases until March 1, 2022, there were 2,303,816 confirmed cases, including nearly 24,999 deaths, or 1.08%. And 2,246,473 cured cases, with a rate of 95. 5% (Ministry of Health / Environment / Public Health Department. 2022). According to the WHO, viral infections are still emergent transmitted diseases, and on 30th January 2020, the WHO Emergency Committee asserted this disease as an emergency health issue globally.

Balkhair, (2020) reported that the clinical symptoms of COVID-19 range in severity from mild, moderate, and serious cases. Kurtaiş Aytür, et al., (2021) revealed that according to epidemiological statistics, the greater number of the patients infected with COVID-19 were at 20-60 years of age with a higher incidence among males. The greater (81.4%) cases were mild (81.4%), 13.9% were severe cases, and 4.7% were critical cases. COVID-19 disease can manifest according to the WHO clinical classification as an extensive range from mild cases, pneumonia, severe pneumonia, acute respiratory distress syndrome (ARDS), sepsis condition, and septic shock. The most common clinical manifestations are dyspnea, fever, coughing, hypoxia, sore throat, headache, muscle pain, and fatigue (Singhal, 2020). It is necessary to apply an intervention to improve oxygen and reduce its need, or endotracheal. Changing the patient's position is one of the additional interventions that these patients may need to increase the chance of gas exchange and improve the breathing process, in addition to reducing the effort during breathing and achieving an effective gas exchange effect by positioning the patient appropriately for patients with pneumonia associated with COVID-19 (Retucci, et al., 2020). Changing the patient’s position can affect the physiological mechanics of the respiratory system by changing compliance and/or resistance of the respiratory system and its chest wall and lungs components, and by changing static lung volume (Mezidi, & Guérin, 2018). Arık & Çevik, (2021) mentioned that the postural drainage and coughing exercises, as a part of pulmonary rehabilitation are effective in improving pulmonary function and oxygen saturation. The nurses need to take a role in training patients about the benefits of coughing exercises and how to do exercises efficiently, and in encouraging them to do it regularly.

Methodology

An experimental study design was carried out in the COVID-19 wards at Imam Al-Hussein Medical City in Holy Karbala, Iraq, the study was initiated from the period of October 2021 to March 2022, to determine the effect of prostrate

position and coughing exercises upon the level of dyspnea and persistent cough among non-intubated patients with COVID-19 and to find out the relationship between the effect of prostrate position and coughing exercises upon the level of dyspnea and persistent cough with patients' socio-demographic characteristics and clinical data. A systematic random sampling method of 60 patients was included in this study, 30 of them participated as an experimental group and the other as a control group. The levels of dyspnea and cough severity were measured initially and then carried out the interventional protocol that was consisted of two overlapping procedures (prostration position and coughing exercises) so that the patient was placed in prostration position for a full hour and the coughing exercises were performed for the patient at the first time of prostration. The levels of dyspnea and cough severity were measured at three different times after the intervention that is as follows immediately after the completion of the intervention; four hours after the intervention, and seven hours after the intervention. A questionnaire form was prepared by the researchers to collect all the relevant data associated with the study sample, it is involving three main parts: the first part includes participants' socio-demographic and clinical data; the second part measures the cough severity index (CSI) it is consists of 10 items, this scale has been modified in response to the experts' opinions, the original scale was designed by Shembel, et al., (2013) to measure the severity of a patient's cough. The third part includes the modified version of the dyspnea index (DI) that was constructed by Gartner-Schmidt, et al., (2014) to measure the severity of a patient's dyspnea, it includes a 10-items. The data were collected directly from patients by the researchers through the interviewing technique. Finally, the data were analyzed by using the program of IBM Statistical Package of Social Sciences (SPSS) Version 23, both descriptive statistical analysis procedures (frequency, percentage) and inferential statistical analysis (repeated measurement ANOVA and chi-square) were used to analyze and assess the results of the study, a p-value <0.05 was considered statistically significant.

Results

Table (1): Distribution of socio-demographic characteristics of patients with COVID-19

Socio-demographic Characteristics		Control group		Experimental group	
		f.	%	f.	%
Age/years	20-39	2	6.7	3	10
	40 - 59	8	26.7	8	26.7
	≥ 60	20	66.6	19	63.3
	Total	30	100	30	100
Gender	Male	14	46.7	18	60
	Female	16	53.3	12	40
	Total	30	100	30	100
Smoking condition	Never	20	66.7	23	76.7
	Previous	9	30	4	13.3
	Currently	1	3.3	3	10
	Total	30	100	30	100
Second-	Yes	23	76.7	24	80

hand smoke	No	7	23.3	6	20
	Total	30	100	30	100
Body mass index	Normal weight	5	16.7	7	23.3
	Overweight	7	23.3	1	3.3
	Obesity class I	14	46.7	16	53.3
	Obesity class II	3	10	3	10
	Obesity class III	1	3.3	3	10
	Total	30	100	30	100

f.: frequency; %: percentage.

Table (1) indicates that the majority of the patients who participated in the experimental and control group were within age group (≥ 60) years old and accounted (63.3%) and (66.6%) for experimental and control group respectively; about two-thirds (60%) of the experimental group and approximately one half (46.7%) of the control group were males. In concern to the smoking status, the result in this table reveals that more than three quarters (76.7%) of the participant in the experimental group and two-thirds (66.7%) in the control group were never smoking, and most of them were exposed to secondhand smoking. Finally, and regarding the body mass index of the participant, the result indicates that 53.3% and 46.7% in the experimental and control group respectively were obese class I.

Table (2): Distribution of clinical data of patients with COVID-19

Clinical data			Control group		Experimental group	
			f.	%	f.	%
		Hypertension	7	23.3	4	13.3
		Asthma	9	30.0	8	26.7
		DM	3	10	7	23.3
		Non	11	36.7	11	36.7
		Total	30	100	30	100
Infected part of the lung	Bilateral - peripheral & central		12	40	13	43.3
	Bilateral-central		8	26.7	12	40
	Bilateral-peripheral		7	23.4	4	13.4
	Left lung- peripheral		1	3.3	1	3.3
	Right lung central		1	3.3	0	0
	Bilateral - lateral		1	3.3	0	0
	Total		30	100	30	100
Percentage of the affected area		15 - 24%	5	16.7	0	0
		25 - 34%	5	16.7	3	10
		35 - 44%	5	16.7	3	10
		≥ 45 %	15	50	24	80
		Total	30	100	30	100
Method of oxygenation therapy		Face mask	20	66.7	18	60
		Re-breather mask	10	33.3	12	40
		Total	30	100	30	100

COVID-19 vaccination status	Yes	3	10	1	3.3
	No	27	90	29	96.7
	Total	30	100	30	100

f.: frequency; %: percentage.

This table shows that is more than one-third (36.7%) of both experimental and control groups did not have any chronic diseases. But 26.7% and 30% for the experimental and control group had asthmatic conditions respectively. As for the infected part of the lung, 43.3% of the experimental group and 40% of the control group were infected in the bilateral-peripheral and central areas of the lungs. 80% of the experimental group and 50% of the control group was with infection percentage of ≥ 45%. In addition to that, a face mask was a method of oxygenation therapy for 60% for the experimental group and 66.7% for the control group. Finally, 96.7% of the experimental group and 90% of the control group did not take the COVID-19 vaccine.

Table (3) Comparison of the effect of prostrate position and coughing exercises on the level of dyspnea and cough severity for the experimental group and the control group

Variables	Experiment group (mean of 30 patients)				Control group (mean of 30 patients)			
	Before	After 1	After 2	After 3	Before	After 1	After 2	After 3
Level of Dyspnea	1.96	1.06	1.28	1.87	1.81	1.86	1.88	1.76
Severity of Cough	1.90	1.20	1.24	1.80	1.81	1.85	1.87	1.89

Before: before implementing the interventional program; After 1: one hour after implementing the interventional program; After 2: four hours after implementing the interventional program; After 3: seven hours after implementing the interventional program.

By using a repeated measurement ANOVA, this table shows that there is a clear statistical significance difference between the mean score of the dyspnea level, and cough level for the experimental group, while there was no statistically significant difference in the control group.

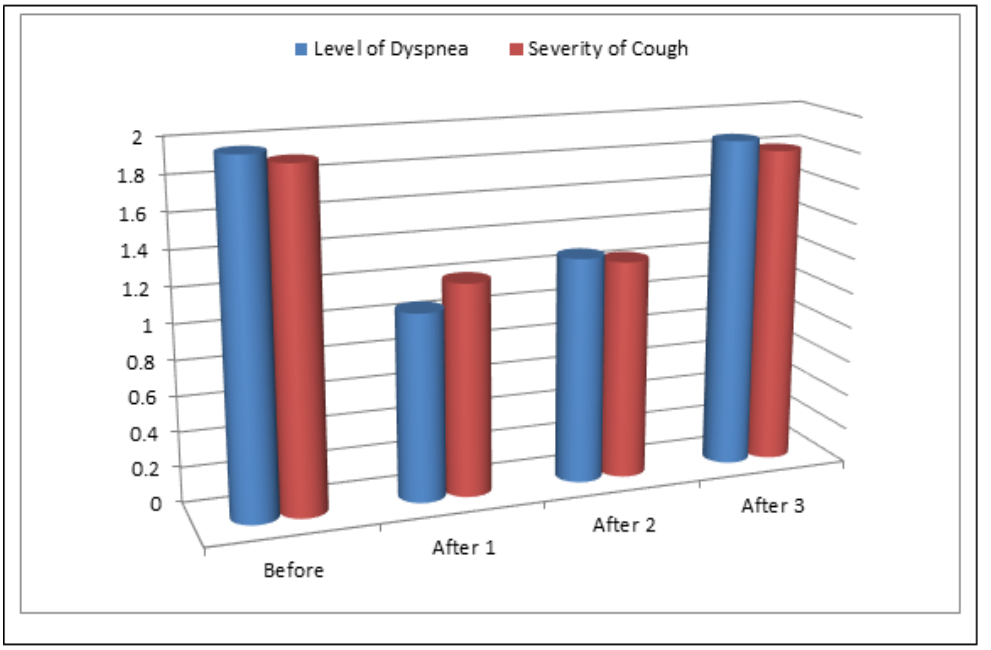

Figure (1) The effect of prostration position and coughing exercises on the level of dyspnea and severity of cough among the experimental group

Table (4): Association between the effect of prostrate position and coughing exercises on the level of dyspnea and cough severity among COVID-19 patients with their socio-demographic characteristics and clinical data

Variable	Dyspnea		Cough	
	P. Value	Significant	P. Value	Significant
Age	0.138	N.S	0.001	S
Gender	0.333	N.S	0.088	N.S
Smoking condition	0.497	N.S	0.277	N.S
Second-hand smoke	0.043	S	0.071	N.S
Body mass index (BMI)	0.011	S	0.528	N.S
Chronic diseases	0.148	N.S	0.056	S
The Infected part of the lung	0.041	S	0.025	S
Percentage of the affected area	0.201	N.S	0.081	N.S
Method of oxygenation therapy	0.193	N.S	0.232	N.S
COVID-19 vaccination status	0.018	S	0.970	N.S

NS: Non-Significant (P value >0.05); S: Significant (P value ≤ 0.05).

By using the chi-square test this table shows that there was a statistically significant association was found between the level of dyspnea and secondhand smoke, BMI, infected part of the lung, and COVID-19 vaccination status. As for the association between cough severity and some socio-demographic information and clinical data, this table shows that there was a statistically significant

association was found between cough severity and age group, chronic diseases, and infected part of the lung.

Discussion

Controlling the severity of COVID-19 is significantly dependent on improving the oxygenation status by enhancing the gas exchange. A total of 60 patient diagnosed with COVID-19 was involved in this study to evaluate the effect of prostrate position and coughing exercises upon the level of dyspnea and persistent cough among non-intubated patients with COVID-19.

Concerning the socio-demographic characteristics of participants as shown in table (1), the result indicates that approximately two-thirds of them were ≥ 60 years old and accounted for 63.3% for the experimental group and 66.6% for the control group. Boehmer, et al., (2020) reported that are early in the COVID-19 pandemic, the incidence was highest among the elderly. From June to August 2020, the incidence of COVID-19 was highest in individuals aged 20 to 29 years, that is accounted for more than 20% of all diagnosed cases. Younger adults possibly contribute to the transmission of COVID-19 in the community. In June 2020, the percentage of positive SARS-CoV-2 increases among aged 20 to 39 years. The researchers believe that the number of elderly COVID 19 patients among the study sample had increased due to the compromised immune system. Mueller, et al., (2020) described it as "the aging innate immune system" that led to their intolerance to the complications of the disease, which led to their hospitalization, unlike the group of young people who have good immunity and a healthy body that helps them withstand the disease.

As for gender, the results of the study indicate that 60 % were male, and 40% were female for the experimental group, while in the control group was 46.7 % are male and 53.3 % are female. The researchers show that this convergence in the percentages of the sample by gender (male and female) means that there were no clear differences between the gender and the virus-infected both gender with a similar chance. Jin, et al., (2020) stated that while women and men have a similar prevalence, they are emphasized that the men with COVID-19 are at increased risk for worse outcomes, independent of aging. Marik, et al., (2021) reported that the COVID-19 causes severe disease in men that is not due to the effect of comorbidities or age; however, many experimental studies exposed that men had evidence of the highest inflammatory response. Estrogens inhibit the production of pro-inflammatory cytokines that is the main mechanism clarifying the gender differential COVID-19 patients.

Concerning smoking status, the result indicated that 76.7% of the experimental group and 66.7% of the control group were non-smokers. This means that this disease is not limited to smokers only but includes all groups. Vardavas and Nikitara, (2020) revealed that among 78 patients infected with COVID-19 that had a significantly higher percentage (27.3%) of patients with a smoking history, the smoking history was a risk factor of COVID-19. Patanavanich and Glantz (2021) exposed that smoking is one of the most important risk factors for having COVID-19 infection, including mortality. The smoking effects appear to be higher among

young persons. And therefore smoking cessation should still be a priority for the prevention of COVID-19 infection.

As shown in table (1) the study findings reveal that 80 % of the experimental group and 76.7% of the control group were exposed to second-hand smoke. This ratio was because that second-hand smoke exposure was harmful to young people and the elderly. They inhale double dust particles amount. This raises the harm rate to the lungs, making it more susceptible to the microorganisms' invasion, especially the COVID-19 (Osinibi, et al., 2021). A study by Garcia, et al., (2021) reported that the ratio of men infected by COVID-19 was similar to women and accounted for about 50.4% and 49.6% respectively, the mortality rate was significantly higher (4.7%) in men in comparison with women (2.6%), these differences could be due to variances in patterns of smoking and prevalence between the gender.

Body mass index is also determined as a significant factor associated with the different disease processes. As shown in table (1) that are most of the participants are having obesity class I, accounting for 53.3% for the experimental group and 46.7% for the control group. Raisi-Estabragh, et al., (2020) reported that among participants infected with COVID-19 infection with moderate to severe symptoms, the higher body mass index is accompanied by a COVID-19 infection. The researchers show that the reasons for weight gain among participants were attributed to two reasons: the first one, that nearly half of the sample was women, and therefore studies were confirming that weight gain among elderly Iraqi women was very high. The second reason, it was not surprising that most of those infected with COVID-19 who have severe complications suffer from being overweight; resulting in severe impairment of organs and tissues due to these complications involving mechanical changes caused by the accumulation of adipose tissues.

Furthermore, the result in table (1) exposed that 36.7% of the sample for experimental and control groups do not suffer from any chronic diseases. This percentage does not constitute an absolute majority due to the convergence of some percentages, especially since approximately 30% of the sample suffers from asthma. The asthmatic patient was likely to suffer from exacerbations caused by other triggers, or even by stopping regular use of prescribed medications, these triggers surprise the immune system. The exacerbation of asthma increases when the amount of stimuli increases and since the coronavirus is itself considered one of the triggers for an asthma attack in addition to the respiratory complications that it causes in addition to asthma complications. Thus, it makes asthmatic patients infected with the Coronavirus suffer from severe complications, and the chances of them being hospitalized increase and the length of their stay were prolonged (the researchers).

A study that was done by Adir, et al., (2021) stated that chronic or continuing use of systemic corticosteroids as treatment of asthma before COVID-19 infection is the main risk factor of low outcomes and decrease survival in patients' asthma. another study that was done by Lee, et al., (2020) reported that asthma does not consider a risk factor for a bad prognosis of COVID-19 infection. However, asthmatic patients who had any experience of acute status in the previous year

before COVID-19 exhibited increased COVID-19-related mortality, particularly in old age and male gender.

Regarding the infected part of the lung for patients enrolled in this study, the result in the table (2) exposed that 43.3%m and 40% of patients infected with COVID-19 are suffered from an infection in the bilateral-peripheral and central area of the lung, for experimental and control group respectively, these findings come along with the study that was done by Soldati, et al., (2020) exposed that after analysis of the accessible computed tomographic scan (CT-scan) records from COVID-19 patients shows chiefly some confluent and patchy bilateral lesions, look like as ground glass or with mixed ground glass and consolidative pattern. Confluent or patchy lesions tend to be distributed along the pleura. The lower right lobe of the lung is most commonly affected, followed by the lower and upper left lobes. Castelao, et al., (2021) conducted a prospective study among patients with the diagnosis of COVID-19 infection exposed that the ultrasound involvement in COVID-19 infection is heterogeneous and bilateral, the lower and posterior regions are the most affected lungs areas.

Among patients enrolled in this study, and regarding the percent of the affected area of the lungs, the result in table (2) indicates that one half (50%) of the control group and 80% of the experimental group have had ≥ 45 % of their lungs are affected with COVID-19 infection. The researchers show that this was evident in the study sample because the study was conducted on hospitalized patients and most of them have a very high rate of lung damage. Approximately two-thirds of patients enrolled in the experimental and control group were using a face mask as a method of oxygen administration. This was attributed to the fact that the type of patients who were selected was non-intubated and not from critical cases according to the study criterion, so this method of oxygen therapy was suitable for most of them. Furthermore, concerning COVID-19 vaccination status, the result reveals that 90% and 96.7% of the sample for both experimental and control groups do not take COVID 19 vaccine. This finding comes along with the result of the study that was done by Abdulah, (2021) in the Dohuk city/Iraq on 926 patients with COVID-19, indicating that 83.5% of the participants have not taken any type of COVID-19 vaccination.

The application of prostrate position and coughing exercises among patients with COVID-19 enrolled in this study exposed, it is very useful to use prostrate position and coughing exercises to facilitate breathing patterns and decrease the severity of cough, as shown in table (3) the result indicates that there is a statistically significant difference was found between the mean score of the dyspnea level, and severity of cough for the experimental group, while there is no statistically significant difference was found among patients in the control group. Among the experimental group the level of dyspnea and the severity of cough was decreased immediately and four hours after applying for the prostrate position and coughing exercises. This result was attributed to this position redistributed lung densities from the dorsal to ventral regions. This finding led to the “sponge lung model”, where COVID-19 was characterized by a heavy edematous lung that can be compared to a wet sponge this, in turn, causes dyspnea and coughing. Touchon, et al., (2021) conducted a study entitled "Awake prone positioning for hypoxemic respiratory failure: past, COVID-19, and perspectives" mentioned that

the prone position makes reallocated lung densities from the dorsal area to the ventral area. This study emphasized that awake patients with COVID-19 may improve oxygenation during the prone position, but persistence after re-supination and the effect on clinical outcomes are still not detected.

Moreover, regarding the relationship between the effect of prostrate position and coughing exercises with the participants' socio-demographic characteristics and clinical data, the result in table (4) exposed that there is statistically significant relationship was found between the effect of prostrate position and coughing exercises on dyspnea level with second-hand smoke, BMI, infected part of the lung, and COVID-19 vaccination status. In addition to that, the result in this table exposed that there is statistically significant relationship was found between the effect of prostrate position and coughing exercises on the severity of cough with age group, chronic diseases, and infected part of the lung. Lee, et al., (2021) conducted a study in Costa Rica that indicated an association between shortness of breath, secondhand smoking, and BMI. They also exposed that dyspnea is influenced by gender. Altuntas, et al (2021) conducted a study in Turkey to evaluate COVID-19 patients diagnosed with chronic diseases, indicated that there is a significant association between COVID-19 infection and age and chronic illness, that most of the patients were elderly, and they had hypertension, diabetes mellitus, cardiovascular diseases, and chronic obstructive pulmonary disease.

Conclusion

Our study findings indicate that the majority of COVID-19 patients were elderly, about half of them were males and the other half were females, non-smokers, but exposed to secondhand smoke and suffer from obesity of class I. Also, a large number of them suffer from asthma as a chronic disease, and the damaged part of their lungs was bilateral-peripheral and central, with a damage rate of more than 45%, and most of them were not vaccinated. This study concluded that the prostration position and coughing exercises were very useful in improving gas exchange and relieving the severity of dyspnea and coughing in patients with COVID-19. In addition, this positive effect lasted for more than four hours of implementing the interventional protocol.

Recommendations

1. Patients infected with COVID-19 suffering from dyspnea and persistent cough should be instructed to perform prostration and coughing exercises one hour every four hours.
2. A similar study should be conducted to investigate the effect of prostrate position and coughing exercises upon cardiopulmonary parameters among non-intubated patients with COVID-19.
3. Further studies should be conducted to demonstrate the benefit of prostration for patients with other respiratory diseases.

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Ethical Clearance: An approval was attained from the Scientific Research Ethical Committee from the University of Kerbala/ Nursing College. Informed consent was obtained from each participant to be enrolled in this study. Furthermore, each participant is given the right to be withdrawn from the study at any time.

References

1. Abdulah, D. (2021). Prevalence and correlates of COVID-19 vaccine hesitancy in the general public in Iraqi Kurdistan: A cross-sectional study. *Journal of Medical Virology*. *93*: 6722-6731. https://doi.org/10.1002/jmv.27255ABDULAH|6731
2. Adir, Y., Saliba, W., Beurnier, A., and Humbert, M. (2021). Asthma and COVID-19: an update. Eur Respir Rev; 30: 210152. DOI: 10.1183/16000617.0152-2021
3. Altuntas, M., Yilmaz, H., and Guner, A. (2021). Evaluation of patients with COVID-19 diagnosis for chronic diseases. Virology journal, 18(1), 57. https://doi.org/10.1186/s12985-021-01524-0
4. Arık, S., and Çevik, K. (2021). Effect of Postural Drainage and Deep Breathing-Cough Exercises on Oxygen Saturation, Triflo Volume and Pulmonary Function Test in Patients with COPD. Journal of Clinical and Experimental Investigations, 12(4), em00780. https://doi.org/10.29333/jcei/11269
5. Balkhair A. (2020). COVID-19 Pandemic: A New Chapter in the History of Infectious Diseases. Oman medical journal, 35(2), e123. https://doi.org/10.5001/omj.2020.41
6. Boehmer, T., DeVies, J., Caruso, E., et al. (2020). Changing Age Distribution of the COVID-19 Pandemic — United States, May–August 2020. *Morbidity and Mortality Weekly Report*, *69*(39), 1404-1409. DOI: http://dx.doi.org/10.15585/mmwr.mm6939e1external icon
7. Castelao, J., Graziani, D., Soriano, J., and Izquierdo, J. (2021). Findings and Prognostic Value of Lung Ultrasound in COVID-19 Pneumonia. Journal of ultrasound in medicine : official journal of the American Institute of Ultrasound in Medicine, 40(7), 1315–1324. https://doi.org/10.1002/jum.15508
8. Faris, S., Athbi, H., Mansoor, H., Mahmood, F., Almalike, M., Kumait, A., Jabor, H., Al-Juboori, A., Salman, M., Hade, A., and Al zuhairy, M. (2021). Risk Perception and Public Attention toward COVID-19 Outbreak in Iraq. Annals of the Romanian Society for Cell Biology, 15791–15805. Retrieved from https://www.annalsofrscb.ro/index.php/journal/article/view/5235

9. Garcia, L., Abreu, C., Abe, A., and Matos, M. (2021). Reflections on passive smoking and COVID-19. Revista da Associacao Medica Brasileira (1992), 67Suppl 1(Suppl 1), 22–25. https://doi.org/10.1590/1806-9282.67.Suppl1.20201047
10. Gartner-Schmidt, J., Shembel, A., Zullo, T., and Rosen, C. (2014). Development and validation of the Dyspnea Index (DI): a severity index for upper airway-related dyspnea. Journal of voice: official journal of the Voice Foundation, 28(6), 775–782. https://doi.org/10.1016/j.jvoice.2013.12.017
11. Jin, J-M., Bai, P., He, W., Wu, F., Liu, X-F., Han, D-M., Liu, S. and Yang, J-K. (2020). Gender Differences in Patients with COVID-19: Focus on Severity and Mortality. Front. Public Health 8:152. doi: 10.3389/fpubh.2020.00152
12. Kurtaiş Aytür, Y., Köseoğlu, B., Özyemişçi Taşkıran, Ö., Ordu-Gökkaya, N., Ünsal Delialioğlu, S., Sonel Tur, B., Sarıkaya, S., Şirzai, H., Tekdemir Tiftik, T., Alemdaroğlu, E., Ayhan, F., Duyur Çakıt, B., Genç, A., Gündoğdu, İ., Güzel, R., Demirbağ Karayel, D., Bilir Kaya, B., Öken, Ö., Özdemir, H., Soyupek, F., … Tıkız, C. (2020). Pulmonary rehabilitation principles in SARS-COV-2 infection (COVID-19): A guideline for the acute and subacute rehabilitation. Turkish journal of physical medicine and rehabilitation, 66(2), 104–120. https://doi.org/10.5606/tftrd.2020.6444
13. Lee, S., Lasky-Su, J., Lange, C., Kim, W., Kumar, P., McDonald, M., Vaz Fragoso, C., Laurie, C., Raby, B., Celedón, J., Cho, M., Won, S., Weiss, S., Hecker, J., and NHLBI Trans-Omics for Precision Medicine (TOPMed) Consortium .(2021). A novel locus for exertional dyspnoea in childhood asthma. The European respiratory journal, 57(2), 2001224. https://doi.org/10.1183/13993003.01224-2020
14. Lee, S., Son, K., Han, C., Jung, J., & and Park, S. (2020). Impact of comorbid asthma on severity of coronavirus disease (COVID-19). *Scientific reports*, *10*(1), 1-9. https://doi.org/10.1038/s41598-020-77791-8
15. Marik, P., DePerrior, S., Ahmad, Q., and Dodani. S. (2021). Gender-based Disparities in COVID-19 Patient Outcomes. Journal of Investigative Medicine. 69:814-818. Retrieved from https://jim.bmj.com/content/69/4/814.info
16. Mezidi, M., and Guérin, C. (2018). Effects of patient positioning on respiratory mechanics in mechanically ventilated ICU patients. Annals of translational medicine, 6(19), 384. https://doi.org/10.21037/atm.2018.05.50
17. Ministry of Health / Environment / Public Health Department. 2022. The daily epidemiological and vaccination situation of the Corona pandemic in Iraq, March 1, 2022. https://www.facebook.com/MOH.GOV.IQ
18. Mueller, A., McNamara, M., & Sinclair, D. (2020). Why does COVID-19 disproportionately affect older people?. Aging, 12(10), 9959–9981. https://doi.org/10.18632/aging.103344
19. Osinibi, M., Gupta, A., Harman, K., and Bossley, C. (2021). Passive tobacco smoke in children and young people during the COVID-19 pandemic. The Lancet. Respiratory medicine, 9(7), 693–694. https://doi.org/10.1016/S2213-2600(21)00231-9
20. Patanavanich, R., and Glantz, S. (2021). Smoking is associated with worse outcomes of COVID-19 particularly among younger adults: a systematic review and meta-analysis. BMC Public Health. 21:1554 https://doi.org/10.1186/s12889-021-11579-x

21. Raisi-Estabragh, Z., McCracken, C., Ardissino, M., Bethell, M., Cooper, J., Cooper, C., ... and Petersen, S. (2020). Non-white ethnicity, male sex, and higher body mass index, but not medications acting on the renin-angiotensin system are associated with coronavirus disease 2019 (COVID-19) hospitalisation: review of the first 669 cases from the UK Biobank. *MedRxiv*.
22. Retucci, M., Aliberti, S., Ceruti, C., Santambrogio, M., Tammaro, S., Cuccarini, F., Carai, C., Grasselli, G., Oneta, A. M., Saderi, L., Sotgiu, G., Privitera, E., and Blasi, F. (2020). Prone and Lateral Positioning in Spontaneously Breathing Patients with COVID-19 Pneumonia Undergoing Noninvasive Helmet CPAP Treatment. Chest, 158(6), 2431–2435. https://doi.org/10.1016/j.chest.2020.07.006
23. Shembel, A., Rosen, C., Zullo, T., & Gartner-Schmidt, J. (2013). Development and validation of the cough severity index: a severity index for chronic cough related to the upper airway. The Laryngoscope, 123(8), 1931–1936. https://doi.org/10.1002/lary.23916
24. Singhal, T. (2020). A Review of Coronavirus Disease-2019 (COVID-19). Indian journal of pediatrics, 87(4), 281–286. https://doi.org/10.1007/s12098-020-03263-6
25. Soldati, G., Smargiassi, A., Inchingolo, R., Buonsenso, D., Perrone, T., Briganti, D., Perlini, S., Torri, E., Mariani, A., Mossolani, E., Tursi, F., Mento, F., and Demi, L. (2020). Is There a Role for Lung Ultrasound During the COVID-19 Pandemic?. Journal of ultrasound in medicine : official journal of the American Institute of Ultrasound in Medicine, 39(7), 1459–1462. https://doi.org/10.1002/jum.15284
26. Touchon, F., Trigui, Y., Prud'homme, E., Lefebvre, L., Giraud, A., Dols, A., Martinez, S., Bernardi, M., Begne, C., Granier, P., Chanez, P., Forel, J., Papazian, L., and Elharrar, X. (2021). Awake prone positioning for hypoxaemic respiratory failure: past, COVID-19 and perspectives. European respiratory Review: an official journal of the European Respiratory Society, 30(160), 210022. https://doi.org/10.1183/16000617.0022-2021
27. Vardavas, C., and Nikitara, K. (2020). COVID-19 and smoking: A systematic review of the evidence. Tobacco induced diseases, 18, 20. https://doi.org/10.18332/tid/119324
28. World Health Organization. (2022). COVID-19 weekly epidemiological update, edition 80, 22 February 2022. https://apps.who.int/iris/handle/10665/352199
29. Jalil, A. T., Kadhum, W. R., Khan, M. U. F., Karevskiy, A., Hanan, Z. K., Suksatan, W., ... & Abdullah, M. M. (2021). Cancer stages and demographical study of HPV16 in gene L2 isolated from cervical cancer in Dhi-Qar province, Iraq. Applied Nanoscience, 1-7. https://doi.org/10.1007/s13204-021-01947-9
30. Widjaja, G., Jalil, A. T., Rahman, H. S., Abdelbasset, W. K., Bokov, D. O., Suksatan, W., ... & Ahmadi, M. (2021). Humoral Immune mechanisms involved in protective and pathological immunity during COVID-19. Human Immunology. https://doi.org/10.1016/j.humimm.2021.06.011
31. Moghadasi, S., Elveny, M., Rahman, H. S., Suksatan, W., Jalil, A. T., Abdelbasset, W. K., ... & Jarahian, M. (2021). A paradigm shift in cell-free approach: the emerging role of MSCs-derived exosomes in regenerative medicine. Journal of Translational Medicine, 19(1), 1-21. https://doi.org/10.1186/s12967-021-02980-6

32. Saleh, M. M., Jalil, A. T., Abdulkereem, R. A., & Suleiman, A. A .(2020). Evaluation of Immunoglobulins, CD4/CD8 T Lymphocyte Ratio and Interleukin-6 in COVID-19 Patients. TURKISH JOURNAL of IMMUNOLOGY, 8(3), 129-134. https://doi.org/10.25002/tji.2020.1347
33. Turki Jalil, A., Hussain Dilfy, S., Oudah Meza, S., Aravindhan, S., M Kadhim, M., & M Aljeboree, A. (2021). CuO/ZrO2 nanocomposites: facile synthesis, characterization and photocatalytic degradation of tetracycline antibiotic. Journal of Nanostructures. https://doi.org/10.22052/JNS.2021.02.014
34. Sarjito, Elveny, M., Jalil, A., Davarpanah, A., Alfakeer, M., Awadh Bahajjaj, A. & Ouladsmane, M. (2021). CFD-based simulation to reduce greenhouse gas emissions from industrial plants. International Journal of Chemical Reactor Engineering, 20210063. https://doi.org/10.1515/ijcre-2021-0063
35. Marofi, F., Rahman, H. S., Al-Obaidi, Z. M. J., Jalil, A. T., Abdelbasset, W. K., Suksatan, W., ... & Jarahian, M. (2021). Novel CAR T therapy is a ray of hope in the treatment of seriously ill AML patients. Stem Cell Research & Therapy, 12(1), 1-23. https://doi.org/10.1186/s13287-021-02420-8
36. Jalil, A. T., Shanshool , M. T. ., Dilfy, S. H. ., Saleh, M. M., & Suleiman, A. A. . (2022). HEMATOLOGICAL AND SEROLOGICAL PARAMETERS FOR DETECTION OF COVID-19. Journal of Microbiology, Biotechnology and Food Sciences, e4229. https://doi.org/10.15414/jmbfs.4229
37. Vakili-Samiani, S., Jalil, A. T., Abdelbasset, W. K., Yumashev, A. V., Karpisheh, V., Jalali, P., ... & Jadidi-Niaragh, F. (2021). Targeting Wee1 kinase as a therapeutic approach in Hematological Malignancies. DNA repair, 103203. https://doi.org/10.1016/j.dnarep.2021.103203
38. NGAFWAN, N., RASYID, H., ABOOD, E. S., ABDELBASSET, W. K., Al-SHAWI, S. G., BOKOV, D., & JALIL, A. T. (2021). Study on novel fluorescent carbon nanomaterials in food analysis. Food Science and Technology. https://doi.org/10.1590/fst.37821
39. Marofi, F., Abdul-Rasheed, O. F., Rahman, H. S., Budi, H. S., Jalil, A. T., Yumashev, A. V., ... & Jarahian, M. (2021). CAR-NK cell in cancer immunotherapy; A promising frontier. Cancer Science, 112(9), 3427. https://doi.org/10.1111/cas.14993