

Evaluation of Clinical and Laboratory data of COVID-19 Patients in Comparison with CT Scan Findings

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Abstract

Introduction: In order to better evaluate the coronavirus disease, examination of laboratory, radiological and clinical findings can help the researcher to treatment of COVID-19 Patients. This study aimed to highlight the evaluation of clinical and laboratory data of covid-19 patients in comparison with CT scan findings.

Methods: This retrospective study was performed on COVID-19 patients admitted to Baqiyatallah Hospital in Tehran (Iran) in 2019. In this study, laboratory findings, CT scan, clinical signs, comorbidity and its changes were examined.

Results: This study was performed on 400 patients (265 males and 135 females) covid-19 patients. In this study, the variables of age, CRP, POLY, CR and RBC on the length of hospital stay and also the variables of age, oxygen saturation, POLY, LYMPH, RBC, BUN, Ca, Mg and AST significant affect the death of patients.

Conclusion: According to the results of this study, it is recommended to measure the laboratory variables CRP, POLY, RBC, LYMPH, BUN, ESR, and WBC and to study the trend of changing these variables to predict death and length of hospital stay of patients with COVID-19.

Keywords: COVID-19, Death, Length of stay in hospitals (ALOS).

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Introduction

Corona disease (Covid-19) is a new viral disease that was first reported in Wuhan, China in 2019 and showed symptoms similar to pneumonia. The World Health Organization introduced the Covid-19 disease as the sixth public health emergency and finally declared this disease as a pandemic in March 2020 ¹. According to the latest global statistics of "World meter" database, the United States has the highest number of infected people in the world. In this ranking, Iran ranks 11th in the world ². Looking at the statistics published about the rate of infection with the coronavirus, it can be seen that some neighboring countries, despite the great climatic and geographical similarities, in terms of the rate of infection ³. The diseases of covid-19 are very different. As an example, the number of infected people in Iran is

347,835, and its neighboring country, Iraq, with a population of about half of Iran, has 184,709 infected people, or the number of infected people in Malaysia is 9,219, while its neighboring country is Indonesia with an infection rate of 143,043 ⁴. The cause of corona disease is a virus from the family of corona viruses, which is very similar to the virus that causes SARS ⁵. Most of the patients with covid-19 show mild symptoms such as dry cough, sore throat and fever, and most of these patients recover without any special complications. However, a small number of patients develop severe complications such as life-threatening organ failure, septic shock, pulmonary edema, severe pneumonia, and acute respiratory syndrome (ARDS) ⁶. In this disease, about 54% of those suffering from this disease are men ⁷. The

average age of people infected with this disease is 56 years. It should be noted that patients who need special care are elderly and suffering from underlying diseases such as diabetes, heart and respiratory diseases ⁸. The COVID-19 virus, in case of coughing or sneezing, spreads through droplets of saliva or secretions from the nose. Currently, there is no vaccine or specific treatment for COVID-19. However, many clinical trials around the world are evaluating potentially useful methods in the treatment of this emerging disease ⁹. Umifenovir (brand name Arbidol) is an antiviral drug for influenza infection that is used in Russia and China. This drug is produced by the Russian pharmaceutical company Pharm standard ¹⁰. Although some Russian studies have shown that this drug is effective in treating influenza, it has not been approved for use in other countries. The lack of a specific drug in the field of this disease and the depth of human ignorance in this field prompted us to examine the clinical and laboratory data of patients with covid-19 in comparison with the CT scan findings.

Materials and Methods

This study is a retrospective one. The inclusion criteria of the participants in this study were to confirm the infection of the Covid-19 disease using the RT-PCR method (throat swab sample) or CT scan of the chest in accordance with the guidelines of the World Health Organization, inclination by participating in the study, staying in other hospitals, the percentage of oxygen saturation is less than 93%. Patients who requested to withdraw from the study for any reason or whose outcomes were incompletely recorded were excluded from the study. The community of participants in this study consisted of patients infected with covid-19 hospitalized in Baqiyatallah Hospital. The medical records of the participants in this study were extracted after meeting the conditions for entering the study. After selecting the patients, meeting the conditions for entering the study, the medical records of the patients were extracted and their information was entered into the SPS software and finally analyzed. In this study, all the tools used, the calibrated tools and the kits used to diagnose the disease during admission and discharge were the same and had a high diagnostic value. In order for the radiology results to be the same, a radiology specialist was used to evaluate and report the radiology findings. In this study, descriptive statistics (mean, standard deviation, frequency and proportion) and inferential statistics (chi score test, independent t test, Mann-Whitney test, dependent t test, Wilcoxon test) according to the normality or not of the response variable using the test K-S was used. In this study, SPSS software version 21 and a significant level of 5% is considered as a significant level.

Results

This study was conducted on 400 patients with covid-19 with the aim of "investigating the clinical and laboratory data of patients with covid-19 in comparison with CT scan findings". According to the results reported in this table, most of the participants in this study are male, in the age group of 51 to 60 years, blood group O with RH positive, without smoking and alcohol addiction. The frequency distribution and percentage of background patients of the participants in the study have been reported. According to the results of this study, the four background diseases of hypertension, diabetes, ischemic heart disease and high blood fat were the four background diseases with higher prevalence than other background diseases. The results of this study showed that the drugs used by patients are anti-dyslipidemia drug (statin), anti-hypertensive drug, cardiac drug and respiratory system drug.

Table 1. Distribution of the frequency and percentage of drugs used by the participants in the study

Drug	Number	%
Anti-dyslipidemic	129	32.3%
Antihypertensive	125	31.5%
heart	60	15.0%
Respiratory system	23	5.8%
Immune system	19	4.8%
Steroid drugs	1	0.3%

The results of this study showed that the drugs used by patients are anti-dyslipidemic drug (statin), anti-hypertensive drug, cardiac drug and respiratory system drug.

Table 2. Distribution of frequency and percentage of symptom type of participants in the study.

Sign	Number	%
Cough	359	90.0%
shortness of breath	359	90.0%
body pain	322	80.7%
Fever	244	64%
Vomit	39	9.8%
nausea	38	9.5%
chest pain	37	9.3%
diarrhea	28	7.0%
Olfactory disorder	3	0.8%
Taste disorder	1	0.3%
constipation	0	0.0%
Sore throat	0	0.0%

The frequency distribution of findings related to CT scan results is shown. Therefore, most of the participants in the study were Bilateral, Multifocal and GGO+ Crazy Paving.

Table 3. Frequency distribution of findings related to CT scan results

Category	Number	%
Unilateral	51	17.2%
Bilateral	246	82.8%
Unifocal	6	2.0%
Multifocal	292	98.0%
GGO	80	26.9%
GGO+ Crazy Paving	89	30.0%
Consolidation	39	13.1%
GGO+ Consolidation	89	30.0%

The results of this study showed that the average hospitalization time among patients was 6.6 days with a standard deviation of 4.6 days. Also, in the table below, the distribution of the frequency and percentage of hospitalization time of the participants in the study is shown. According to the results reported in this table, most of the participants were discharged within 4 to 6 days.

Table 4. Distribution of the frequency and percentage of hospitalization time of the participants in the study

Sign	Number	%
<3	65	18
4-6	162	44.9
7-9	79	21.9
10-12	28	7.8
13<	27	7.5

The mean and standard deviation of the variables of vital signs at the time of admission and discharge of patients are shown. Based on the results presented in this table, it can be said that apart from diastolic blood pressure, all four signs of systolic blood pressure, body temperature, oxygen level and heart rate showed a significant change during the hospitalization process. It can be said that shortness of breath and cough decrease significantly during hospitalization.

Table 5. Mean and standard deviation of variables of vital signs at the time of admission and discharge of patients

Variable	Time				P-value
	Discharge		Reception		
	mean	SD	mean	SD	
Systolic blood pressure	123.91	14.60	118.23	5.94	0.001
Diastolic blood pressure	79.52	8.83	78.41	4.40	0.057
body temperature	37.52	0.83	36.46	4.76	0.001
oxygen	87.91	7.33	95.81	1.18	0.001
heart beat	95.89	13.47	81.35	8.68	0.001

Table 6. Frequency and percentage of shortness of breath and cough during admission and discharge of patients.

Variable	Time				P-value
	Discharge		Reception		
	number	%	number	%	
Shortness of breath	359	89.8%	1	0.3%	0.001
Cough	359	89.8%	4	1.1%	0.001

The duration of hospitalization of the patients is shown according to the type of CT scan. Based on the results reported in this table, there is no statistically significant relationship between the type of CT scan and the duration of hospitalization.

Table 7. Duration of hospitalization of patients according to the type of CT scan.

Category	Mean	SD	P-value
Unilateral	5.37	3.76	0.354
Bilateral	5.95	4.63	
Unifocal	6.33	6.50	0.793
Multifocal	5.89	4.54	
GGO	5.36	3.77	0.327
GGO + Crazy Paving	5.94	4.23	
Consolidation	5.36	4.14	
GGO + Consolidation	6.42	5.41	

The mean and standard deviation of the variables of laboratory variables at the time of admission and discharge of patients are shown. Based on the results presented in this table, it can be said that except for POLy, Ca, MAg, AST, ALT, ALKP, other laboratory variables showed significant changes during the hospitalization process.

Table 7. Mean and standard deviation of laboratory variables during admission and discharge of patients

Variable	Time				P-value
	Discharge		Reception		
	mean	SD	mean	SD	
WBC	7.59	4.92	8.51	6.64	0.001
POLY	73.04	13.03	70.54	15.72	0.117
LYMPH	20.69	10.61	21.29	12.59	0.001
RBC	4.86	0.69	7.32	32.99	0.001
HB	14.15	2.02	16.44	27.54	0.001
PLT	197.87	99.76	220.19	121.65	0.001
ESR	43.77	26.92	33.48	38.30	0.001
CRP	32.38	31.64	20.14	22.90	0.012
BUN	16.19	10.73	18.40	16.85	0.012
Cr	1.30	1.37	7.20	27.43	0.032
Na	136.03	4.65	130.33	32.37	0.001
K	4.29	0.84	8.18	28.34	0.001
Ca	8.52	0.83	7.41	2.45	0.375
Mg	2.79	7.87	44.92	107.23	0.285
AST	42.03	30.17	178.82	462.61	0.646
ALT	60.84	69.97	94.30	110.01	0.484
ALKP	195.16	87.23	200.25	57.69	0.091
VTID	19.4	17.3			
LDH	757.61	477.014			
D-Dimer	1.4377	2.29849			

Correlation of changes in laboratory findings with duration of hospitalization has been shown. In this study, except for BUN, K, LYMPH, WBC and HB, other laboratory variables showed a significant relationship with the duration of hospitalization.

Table 8. Correlation of changes in laboratory findings and age with length of hospitalization

variable	Correlation	P-value
PLT	0.179	0.001
CRP	0.136-	0.014
POLY	0.124-	0.017
CR	0.123-	0.019
RBC	0.119	0.021
Na	0.102-	0.05
BUN	0.076-	0.147
K	0.076	0.157
LYMPH	0.066	0.206
WBC	0.052-	0.32
HB	0.047	0.363
age	0.155	0.003

In this study, out of 400 patients examined, 39 patients (9.8%) died. In table 12, the relationship of quantitative basic variables on the death status of patients is shown. Based on age, blood oxygen levels, WBC, POLY, LYMPH, RBC, ESR, BUN, AST showed a relationship with the death of patients. Also, the relationship of quantitative basic variables on the death status of patients is shown. Based on the results of this table, it can be said that patients with high blood pressure and ischemic heart disease, and users of immune system suppressing drugs, anti-dyslipidemic drugs (statins) and antihypertensive drugs have been shown to affect the death status of patients.

Table 9. The relationship of basic (quantitative) variables on the death status of patients.

Variable	Time				P-value
	Discharge		Reception		
	mean	SD	mean	SD	
age	54.00	14.00	68.00	14.00	0.000
SBP	123.83	14.79	124.59	12.84	0.333
DBP	79.38	8.86	80.85	8.50	0.155
temperature	37.50	.85	37.67	.62	0.159
Oxygen	88.84	5.84	79.31	12.50	0.000
Heart beat	95.81	12.88	96.64	18.26	0.916
WBC	7.43	4.94	8.99	4.57	0.019

Variable	Time				P-value
	Discharge		Reception		
	mean	SD	mean	SD	
POLY	72.60	12.40	77.30	17.40	0.000
LYMPH	21.00	10.00	17.50	14.80	0.001
RBC	4.88	0.70	4.66	0.53	0.038
HB	14.18	2.04	13.79	1.75	0.187
PLT	199.50	101.10	182.60	86.20	0.364
ESR	42.90	26.70	51.80	28.40	0.046
CRP	31.50	31.20	40.80	35.00	0.071
BUN	15.80	10.80	20.30	9.50	0.000
Cr	1.30	1.40	1.20	0.40	0.058
Na	136.10	4.50	134.90	5.90	0.146
K	4.30	0.80	4.40	0.80	0.111
Ca	8.50	0.80	8.30	0.90	0.033
P	3.40	1.10	3.00	0.60	0.118
Mg	2.10	2.00	8.10	22.70	0.045
AST	40.00	28.10	60.30	40.40	0.001
ALT	58.00	58.00	89.00	136.00	0.602
ALKP	195.00	87.40	196.70	86.80	0.892
Vit D	19.90	17.50	15.50	20.50	0.674

Discussion

The Covid-19 disease started in the Chinese city of Wuhan at the end of 2019 and spread globally at an increasing speed, so that it was declared a pandemic disease by the World Health Organization within a month [11](#). nCoV2019 is very similar to bat-SL-CoVZC45 and bat-SL-CoVZXC21 strains derived from bats [12](#). Currently, this disease is not fully known due to the ambiguous nature of the virus that causes it, SARS-COV-19, and it is necessary to carry out extensive research in relation to its clinical and laboratory evidence, so that the field of treatment and prevention can be more helpful. be made What has emerged from the evidence of preliminary studies so far indicates the high value of lung CT scan in the diagnosis of the disease, even compared to the virus PCR test [13](#). At the same time that the disease is spreading rapidly, the updated information shows an increase in the death rate of patients from the initial death rate (about 2%) in such a way that sometimes in studies this rate is up to 15%. Corrected and approved [14](#). Although studies related to clinical and laboratory evidence are still

progressing, until now, sufficient comparative information based on comparative data of imaging, clinical and laboratory evidence of Covid-19 has not been included in the scientific literature [15](#). Therefore, this study was designed and organized in order to facilitate future studies and achieve optimal treatment and prevention goals. Based on the results reported, CT scan findings of patients do not affect the length of hospitalization of patients. Among the laboratory variables, changes in PLT, CRP, POLY, CR and RBC variables as well as age affect the duration of hospitalization of patients. In this sense, the results of this study were similar to the studies of Alnor et al. [16](#), Wu et al. [17](#) and Ghahrani et al. [18](#), Deng et al. [19](#). According to the results reported, age, blood oxygen level, POLY, LYMPH, RBC, BUN, Ca, Mg and AST affect the death of patients. Also, based on the information reported, high blood pressure, ischemic heart disease, and the use of antihypertensive drugs also affect death. In this sense, the results of this study are similar to the studies of Ali et al. [20](#), Nascimento et al. [21](#). Simadibrata et al. [22](#), Gharmani et al. [23](#), Alnor et al. [24](#), Wu et al. [25](#). According to the results reported, most of the patients examined in the study were Bilateral, Multifocal and GGO+ Crazy Paving. In this sense, the results of this study were similar to the studies of Wu et al. [25](#) and Nascimento et al. [21](#). Based on the results reported, the variables WBC, LYMPH, RBC, HB, ESR, CRP, BUN, Cr and K changed significantly during the process of admission to discharge. Moutchia, in this sense, the results of this study are similar to the studies of et al. [26](#), Nascimento et al. [21](#), Henry et al. [27](#), Simadibrata et al. [22](#), Alnor et al. [16](#) Wu et al. and colleagues [23](#). Based on the information reported, systolic blood pressure, body temperature, blood oxygen level, heart rate, and also based on the results reported in, shortness of breath and cough of patients during the hospitalization process until discharge. In this sense, the results of this study were similar to the studies of Alnor et al. [24](#), Wu et al. [25](#), Gülsen et al. [28](#), Wu et al. [25](#). Also, overall, the results of this study are similar to the studies of Egalo et al. [29](#), Ali et al. [20](#), Machia et al. [26](#), Zoin et al. [30](#), Wang et al. , Golsen et al. [28](#), Henry et al. [27](#), Simiti-Brada et al. [22](#), Alenor et al. [16](#), Wu et al. [25](#), Ghahrani et al. [23](#) and Deng et al. [19](#).

Conclusion

In fact, based on the results obtained in this study as well as the previous studies, it can be said that the measurement of laboratory variables CRP, POLY, RBC, LYMPH, BUN, ESR, WBC along with CT scan findings can predict Provide a suitable advertisement for the duration of discharge or death of patients infected with corona virus to the specialists of this field of treatment.

Highlights

What Is Already Known?

To enhance the evaluation of coronavirus disease, examining laboratory, radiological, and clinical findings can significantly assist researchers in the treatment of COVID-19 patients.

What Does This Study Add?

Indeed, the findings from this study, along with previous research, suggest that measuring laboratory variables such as CRP, POLY, RBC, LYMPH, BUN, ESR, and WBC, in conjunction with CT scan results, can effectively predict the duration of discharge or mortality for patients infected with the coronavirus, providing valuable insights for specialists in this treatment field.

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Conflict of Interest Disclosures

The authors declare that they have no Conflict of Interest.

Authors' Contributions

All the authors meet the standard authorship criteria according to the recommendations of international committee of medical journal editors.

Ethical Statement

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Consent For Publication

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