Original Research Article

The Effect of Covid-19 on Several Health Parameters Factors of Convalescent Health Care Workers in Diyala Province Hospitals

Maysam Abbas[1], Luma T. Ahmed[1*] and Mohammed A. Alkarkhi[2]

[1]Department of Microbiolog, College of Medicine, University of Diyala, Iraq
[2]Department of Ph.immunology, Baqubaa Hospital, Diyala, Iraq

Corresponding author

A B S T R A C T

The outbreak of coronavirus disease 2019(COVID-19) and pandemic caused by severe acute respiratory syndrome 2(SARS-CoV-2), has become a major concern globally. One hundred Convalescent HCWs patients with Covid-19 works in Diyala, hospitals center, from Oct.2020 to March 2021 were included. We recruited 100 non-infected from healthy people and 100 PCR confirmed infected HCWs. In this study, we have summarized and discussed recent immunological studies focusing on the response of the host immune system, cytokine storms such as IL-6 have been discussed as part of immunopathology mechanisms in SARS –Cov-2 infection. This may help us understand patient's immune status with covid-19. This study calculate that there is a relation between covid-19 infection and Hypertension in addition to patients' Covid IgG titers based on occupation and the investigation of IgG titer after and before 6 months. The percentage of IgM positive were 5(5%) and negative 95 (95%)while the results showed the titer for IgG positive 95 (95%) after 3 months while IgG after 3 months were negative 5(5%) and the results showed the investigated for IgG after 6 months positive 84 (84%) while IgG after 6 months were negative16(16%). Based on occupational parameter, there is no significant differences at ($p < 0.05$) after 3 months but significant difference at ($p < 0.005$) after 6 months. Statistical variations to hypertention, Asthma and diabetic mellitus revealed there is no significant difference in p value ($p<0.05$) after 3 months and no significant difference in p value before 6 months.

Introduction

A cluster of viral pneumonia cases of unknown cause (Pung *et al.,* 2020) subsequently identified as a novel coronavirus (Wu *et al.,* 2020) named as 2019-nCoV or Coronavirus (Zhou *et al.,* 2020) was detected on December 31, 2019, in Wuhan, China (Shi *et al.,* 2020). The infection due to COVID-19 shows its symptoms after an incubation period of *5–14 days (Chan *et al.,* 2020). The first clarification of COVID-19 was occupying solely on signs and symptoms of the infection (primarily fever, cough, and shortness of breath) and dominant other possible causes, especially negative tests for influenza. The first confirmed case of COVID-19 has been reported in Najaf province for the Iranian

student came from Iran on 24 February 2020, followed by 4 cases from one family in Kirkuk province on 25 February, they have also a travel history to Iran. An additional case was recorded on 27 February in Baghdad, for a patient who recently visited Iran (Al-Awlaqi *et al.,* 2020).

The global pandemic of coronavirus disease was first confirmed to have propagation in Iraq in February 2020 and In all Iraqi governorates the cases of COVID-19 have been assured as in the 27 March, mainly in the Iraqi Kurdistan province accounting to 309 (26 %) cases as in 8 April (Al-Mosawi, 2020). During the pandemic condition Iraq announced its first assured cases of SARS-COV-2 infection on 22 February 2020 in Najaf. By April, the number of proven cases had overridden the hundred marks in Baghdad, Basrah, Najaf, Erbil and Sulaymaniyah (Hussein *et al.,* 2020).

The first wave of cytokines and chemokines induced an accumulation of NK cells, as well as plasmacytoid (p)DCs, macrophages, $CD4^+$ T cells and NKT cells in the lungs. A second wave of inflammatory mediators was detected later on day 7 post-infection [cytokines TNF-α, IL-6, IFN-γ, IL-2, IL-5, and chemokines MCP-1, MIP-1a, RANTES, monokine induced by gamma interferon (MIG), IP-10] and correlated with lung infiltration of T cells and neutrophils (Chen *et al.,* 2020).

In COVID-19 infected patients a clinical constellation of cytokine storm, respiratory failure and eventually death is evocative of a "hyperferritinemic syndrome" a condition that resembles a hemophagocytic lymphohistiocytosis (HLH)-like syndrome. One of the most prominent immunological features of patients with primary or infection associated HLH (also referred to as macrophage activation syndrome) is the loss of natural killer (NK) cell effector functions in most types of HLH (Terrell and Jordan, 2013) IFNs induce the transcription of >100 IFN-stimulated genes. These genes enhance the antiviral state in the host and contribute to a positive feedback loop. IFN pathways facilitate macrophages' secretion of

additional proinflammatory (IL-1β, IL-6, IL-8, IL-12, and tumor necrosis factor [TNF]) and antiinflammatory (IL-10) cytokines and chemokines—attracting and activating neutrophils, DCs, and lymphocytes. IL-1β contributes to neutrophil antimicrobial activity (Dinarello, 2018).

B cells mature into long-lived plasma cells within lymphoid tissue called germinal centers, B cells play a key role in the mammalian adaptive immune system, and help protecting the organism against antigenic challenges (Inoue *et al.,* 2018). Initial B cell responses are characterized by the production of IgM antibodies.

Antibody isotypes IgG, IgA and IgM are a primary determinant of Fc structure and thus of activity Production of class-switched IgA and IgG antibodies follows, in mucosal immunity with IgA playing a central role, while IgG is the main isotype involved in systemic antiviral immunity (Wang, 2019). This study concentrated on the immunological response against covid-19 infection with several parameters which changed due to the effect of covid infection.

Materials and Methods

The present study was taking place occurring in Baquba City, the center of Diyala province. The population of this study includes convalescent healthcare workers patients during the period from October 2020 to March 2021. It included 100 health workers patients previously diagnosed with coronavirus infection, their age range from (20-65 years) and 100 healthy humans as control, their age range from (20-65 years). IL6 Detection the IL-6-ELISA is a solid phase Enzyme Amplified Sensitivity Immunoassay performed on the microtiter plate. The amount of substrate turnover is determined colorimetrically by measuring the absorbance, which is proportional to the IL-6 concentration. A calibration curve is plotted and IL-6 concentration in samples is determined by interpolation from the calibration curve.

Statistical Analysis

In this study SPSS (package or social science) statistical program was used to analysis the data. The significant value was chosen at the level (p=0.05).

Results and Discussion

One hundred healthy individuals were included in this study to detect Covid IgM, IgG titer. Just for refreshing memory, the healthy individuals were randomly chosen from blood donors who were attended to the Central Blood Bank in Baquba and from healthy individuals who were attended to the Public Health Laboratory for pre-marriage medical checkup, and all of them were negative for Covid IgM, IgG titer. Titer as shown in table (1).

Among healthy group, these healthy people were picked up randomly from blood donors healthy who came to Baqubas center blood bank these results are clearly lower than those obtained in other studies in the nearby countries, in Turkish people, In chemilumines microparticle immunoassay, IgG antibodies against SARS–Cov were found in serum samples from all individuals. (Alkurt *et al*., 2021).

These differences in occurrence between studies could be attributed to different epidemiological trends of Corona-virus infection in different countries which could be due to environmental factors, geographical differences in host genetic susceptibility, sampling size and immune status.

Statistical variation of patients Covid-19 IgM, IgG (after 3 months and after 6 months of infection). Out of 100 Covid-19 patients, Investigated for IgG (3 and 6 months of infection). The percentage of IgM positive were 5(5%) and negative 95 (95%).

The study showed the investigated for IgG after 3 months positive 95 (95%) while IgG after 3 months negative were 5(5%) and the results showed the investigated for IgG after 6 months positive 84 (84%) while IgG after 6 months negative were 16(16%) as shown in table (2).

This study showed SARS-Cov-2 IgG titer antibodies can be maintained in patients for at least 6 months, as well as the rapid decline f IgM is consistent with many previous observations, the antibodies titer, particularly IgG levels providing a positive signal for anti-secondary infection although IgG and neutralizing antibody. The results of this study showed that there was a highly significant difference in IgG titer 3 and 6 months after infection.

Similar findings have been reported by other researchers as (Long *et al.,* 2020) This study left the onset phase and instead concentrated on the convalescent period. These studies reported on the short term pattern of antibody levels in a small number of population samples, Overall, the findings revealed a few unusual instances that had unusual humoral responses when exposed to COVID-19. Nine of the patients developed a complete antibody response at the start of the disease, but it quickly dropped to nearly undetectable levels by the 20th–24th week, while the other five did not produce a total antibody response at all. The IgG level remained below five in convalescent patients which may be due to the results of RT-PCR were false positive (Xuemei Liu and Jinhua, 2020).

Statistical variation

Statistical variation in patient's Covid IgG titers based on occupation the present study show that patients with IgG titer according occupation was follow as show in the table (3) That number of Doctors patients with IgG titer were (7), the IgG titer after 3 months were (386.59) and after 6 months were (370.13), the number of Laboratory staff patients were (44) the IgG titer after 3 months(339.36) and after 6 months were (273.93). The number of Nurse staff patients were (40), with IgG titers after 3 months was (284.41) and (270.80) after 6 months respectively, The number of administrators staff patients were (4), with IgG titers after 3 months was (128.92) and after 6 months was (159.86), the others group number were (5) and the IgG titer after 3 months was (325.26) and after 6 months was (195.26).

Table.1 The Elisa kit used for determination of IL-6

Interleukin-6 human ELISA(ELISA) kits	Demeditec Diagnostics GmbH	(Germany)

Table.2 Comparative IgM and IgG (3 and 6 months) between study groups by using chi-square test.

Parameters	Patients (n=100)		Controls (n=100)		Statistics
	positive	negative	positive	negative	
IgM	5 (5%)	95(95%)	0 (%)	100 (100%)	P= 0.02* OR= 11.22 (5.11-21.23)
IgG after3months	95 (95%)	5(5%)	0 (%)	100 (100%)	P= 0.001*** OR= 123.11 (99.44- 200.21)
IgG after 6 months	84(84%)	16(16%)	0 (%)	100 (100%)	P= 0.001*** OR= 105 (88.76-150.91)

Table.3 ROC curve , Sensitivity and Specificity of parameters

Varibles	AUC	Std. Error[a]	Sig,	95% C.I Lower upper		Sensitivity %	Specificity %
IgM_Titer	.665	.038	.000	.590	740	67%	36%
IgG_3_Months	1.000	.000	.000	1.000	1.000	99%	52%
IgG_6_Months	1.000	1.000	.000	1.000	1.000	99.5%	37%
IL_6	.628	.042	.002	.545	.711	65%	73%
CRP_Titer	.963	.011	.000	.942	.985	97%	35%

Table.4 Comparative IgG (3 and 6 months) with Occupation of patients by using F test.

Occupation	N	IgG_3_Months		IgG_6_Months	
		Mean	SD	Mean SD	
Lab. Staff	45	253.59	123.65	242.64	111.07
Nurse staff	39	230.50	121.89	241.91	123.07
Doctors	7	362.57	155.69	317.39	156.53
Others	5	317.36	126.26	215.39	109.26
administrators staff	4	175.37	88.92	214.54	107.87
p value		0.75		0.95	

Table.5 Comparative IgG (3 and 6 months) with Chronic diseases of patients by using F test.

Chronic diseases	N	IgG_3_Months		IgG_6_Months	
		Mean	SD	Mean SD	
No	83	258.36	123.21	252.32	134.02
Asthma	3	87.77	44.34	110.61	67.95
Hypertension	7	160.77	76.60	190.36	98.91
Diabetic mellitus	7	342.16	166.73	271.85	132.69
p value		0.46		0.7	

Therefore, these results showed no significant difference at ($p < 0.05$) after 3 months but significant difference at ($p < 0.005$) after 6 months.

This study also revealed that there was a significant increase in Covid IgG titers and job after a period of social distancing which is in line with a previous study of (Lai *et al.,* 2020).

As the epicenter of the epidemic, Hubei province witnessed the highest number of confirmed cases compared to other regions, and medical personnel were exposed to a high risk of infection for a long time. A previous study discovered that Hubei province in China was responsible for 88 percent of COVID-19 infections among medical personnel (Ornell *et al.,* 2020).

Correlations study

The Correlations study of 100 patients were investigated with IgG titer after 3 and 6 months of infection the present study show the 100 patients were tested for Covid-19 IgG after 3 months of infection and reinvestigated tested of the same study group was done after 6 months from infection.

The result was significant difference at ($p < 0.01$) after 3 months and after 6 months, the titer of IgG after 3 months was high and also it remain high after 6 months that mean there is significant difference at ($p < 0.01$) for Covid-19 IgG titer after 3 months and after 6 months as shown in table (4).

In the present study was showed statistical variations to risk factor according to Covid IgG titer. The results revealed that the number of patients infected with Asthma were (3) with IgG titer after 3 months was (290) and IgG titer before 6 months was (395).

Also the results showed that the number of patients infected with diabetic mellitus were (7) with IgG titer after 3 months was (170) and IgG titer before 6 months was (109).

The results revealed that the number of patients infected with hypertention were (7) with IgG titer after 3 months was (181) and IgG titer before 6 months was (320). Finally the results showed that the number of patients infected with diabetic mellitus and hypertention was (1) with IgG titer after 3 months was (1536) and IgG titer before 6 months was (496) So, the results showed there is no significant difference in p value ($p<0.05$) after 3 months and no significant difference in p value before 6 months is shown in table (4).

Because the age group (20-30 years) was of higher number of those without chronic illness age group and the age group (50-60 years) had a lower percentage, there was no link between chronic disease andCovid-19 IgG titer.

The findings of this study were in line with those of earlier research like that of (Zhou *et al.,* 2021). Except for malignancy, there were no significant variations in comorbidities between chronic diseases and patients. Others, on the other hand, accepted the study's flaws. For example, in the transfused trial arm, the number of patients with comorbidities, particularly diabetes, was greater (Salazar *et al.,* 2021).

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