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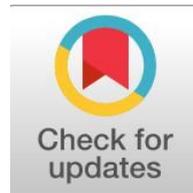
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The Relationship Between COVID-19 Severity and Some Diagnostic Methods

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Abstract

General Background: Coronavirus Disease 2019 (COVID-19), caused by SARS-CoV-2, presents heterogeneous clinical manifestations ranging from asymptomatic to severe conditions, necessitating reliable laboratory indicators for clinical stratification. **Specific Background:** Several diagnostic approaches, including RT-PCR and serological testing, are used to confirm infection; however, additional biomarkers such as IgM, IgG, C-reactive protein (CRP), ferritin, erythrocyte sedimentation rate (ESR), and platelet count have been reported in hospitalized patients. **Knowledge Gap:** Limited data are available regarding the gradient patterns of serological and inflammatory biomarkers across non-severe and severe COVID-19 groups within a single hospitalized cohort. **Aims:** This study measured IgM, IgG, CRP, ferritin, ESR, and platelet levels and examined their association with disease severity among 58 RT-PCR–confirmed patients. **Results:** Non-severe cases constituted 86.21% of patients, while 13.79% were severe. IgM seropositivity was higher than IgG in both groups, reaching 100% in severe cases. IgG positivity increased after the first week of infection and was detected in 83.33% of severe patients. CRP levels were elevated in all non-severe cases, whereas ferritin and ESR were particularly increased in moderate cases. Platelet count, CRP, ferritin, and ESR were significantly higher in the severe group (p<0.05). Age showed a positive correlation with severity (r=0.379). **Novelty:** The study demonstrates a distinct biomarker gradient linking antibody dynamics and inflammatory indices with clinical severity in a defined hospitalized population. **Implications:** Combined assessment of IgM, IgG, CRP, ferritin, and ESR may support early risk stratification and clinical decision-making in COVID-19 management.

Highlights:

• Severe Cases Exhibited Markedly Elevated Crp, Ferritin, Esr, and Platelet Values Compared With Non-Severe Cases.
• Igm Seropositivity Exceeded Igg Across Clinical Categories, Reaching Complete Detection in Critical Patients.
• Increasing Age Showed a Positive Correlation With Worsening Clinical Classification.

Keywords: COVID-19 Severity, Serological Biomarkers, Inflammatory Markers, C-Reactive Protein, Erythrocyte Sedimentation Rate

Introduction

The novel COVID-19 has been caused by severe acute respiratory syndrome coronavirus 'SARS-CoV-2' [1].

Several methods were used to diagnose of COVID-19, like laboratory tests and CT imaging have been indicative in confirmed this disease, they are not unique to SARS-CoV- 2 infection. One of the important laboratory diagnosis techniques, Real-time reverse transcription polymerase chain reaction (RT-PCR) assays were diagnosis viral RNA in the nasal or throat swabs specimens [2]. False-negative outcomes were frequently reported because of the sampling technique and complex preparation procedures ,limiting the usefulness of the assay [3][4][5][6]. For the diagnosis of COVID-19 , accurate ,practical, and quick approaches are required .The detection I antibodies can afford details on the progression of infection [5][7].

 Several studies observed that many biomarkers are important to diagnosis COVID -19 including C-reactive protein "CRP "and erythrocyte sedimentation rate" ESR" as well as platelet count and ferritin were also arising [8][9][10][11][12].

 The aim of this study measures the level of an increase in IgM and IgG and other biomarkers in patients.

Methods

Patients

Fifty-eight COVID-19 patients were confirmed in Basra Teaching Hospital. All patients with confirmed COVID-19 infection (positive nasopharyngeal/throat swab specimens by reverse transcription polymerase chain reaction (RT-PCR)), whereas suspected cases (negative nasopharyngeal/throat swab specimens by RT PCR) with similar clinical symptoms were excluded.

Statistical analysis

The Data was analyzed using SPSS version 16 (IBM; Chicago; IL; USA). The results are shown as mean, standard deviation (SD) and interquartile range. The student's t -test was used to analyze group differences

Results

A total of 58 hospitalized patients participated in this research. Thirty-eight (65.51%) patients were female and 20 (34.48%) were male. Patients were classified to two groups including the non-severe group (NSG) including asymptomatic 27 cases (46.55%), mild 12 cases (20%), and moderate 11 cases (18.96%)). While 8 patients (13.79%) were assigned to the severe group (SG).

The patient's age was in the non-severe group (34.88± 14.59) and severe group (50.43± 17.53). The correlation between the age of patients and disease harshness was found to be positive at 0.379 , figure1

Figure 1 : The positive relationship between age and disease severity
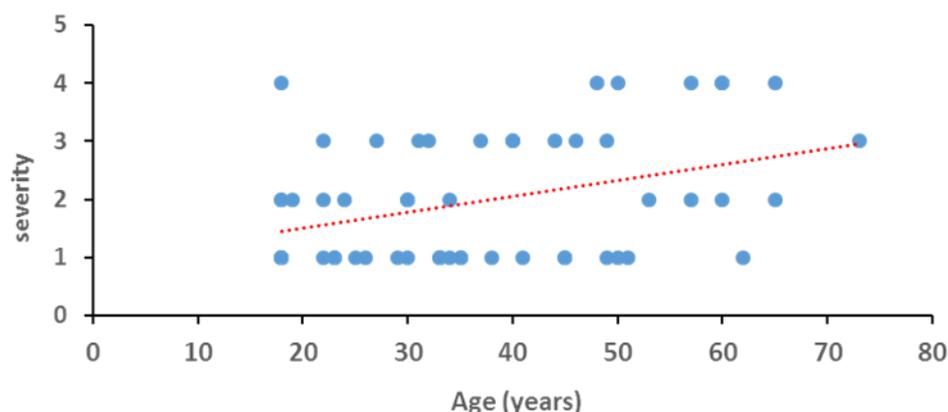
The identification of antibodies including IgM, and IgG in OVID-19 Patients. IgM was observed through the first week and decreased gradually after 14 days, while IgG was appeared after the first week of infection.

The percentage of IgM in both groups of patients were high compare with IgG. In the NSG (asymptomatic, mild, and moderate) IgM was detected in (62.96%, 58%, and 72%) of cases and 100% in SG. IgG was detected in (33.33%, 41.66%, and 63.63%) of cases and 83.33% in severe group as in figure 2.

Figure 2 : The percentage of IgM and IgG in asymptomatic, mild, moderate and severe group
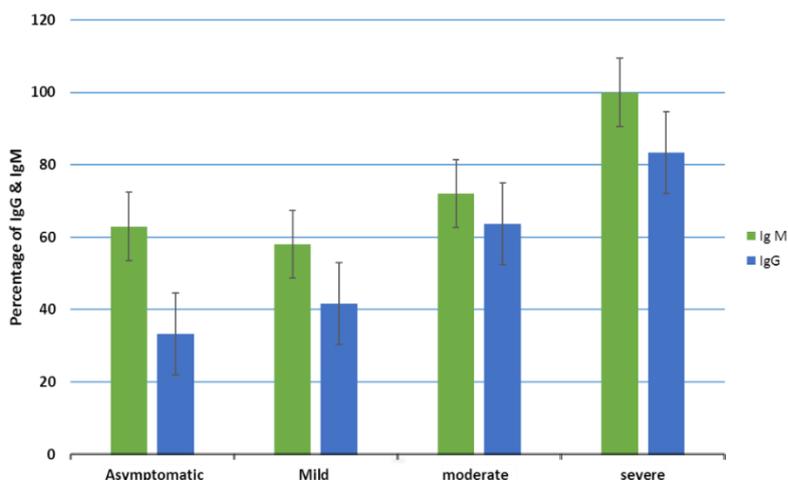

Table 1 shows the laboratory findings of non-severe group included asymptomatic, mild, and moderate . The counts of platelet within normal rang , CRP was high levels in all of non-severe group patients , ferritin and ESR were detected as high levels compare reference range in moderate case,

Table 1. Laboratory findings in non-server group including (Asymptomatic, Mild, and Moderate) COVID-19 patients

Blood routine	References range	Non-Server Group (NSG)		
		Asymptomatic	Mild	Moderate
Platelet	150-450*10^9/L	260.12±71.17	273.25±57.07	221±70.69
CRP	0-5 mg/L	13.59± 33.05	14.1±8.81	44.3±54.92
Ferritin	13-150 ng/ml	71.47±70.32	100.99±80.80	166.53±112.3
ESR	0-20 mm/hr	16.08±24.99	14.4±15.75	30.4±21.91

Table 2 shows the laboratory findings of both groups in patients. counts of platelet, CRP, ferritin, as well as ESR levels were high significant ($p < 0.05$) in SG as compared toNSG.

Table 2. Laboratory findings of both groups in patients

Blood routine	Non severe Group (NSG)	Severe Group (SG)	p-value
Platelet	255. 3 ±69.0	350.4±108.68	0.000
CRP	19.2±37.7	73.5±62.65	0.003
Ferritin	121.9±155.3	283.48±189.12	0.000
ESR	18.9±21.8	69.83±41.77	0.000

Discussion

Our investigation appears although both sexes were affected by the disease , women were more susceptible. There are many factors that cause the differences including gender inequities, socioeconomic status, occupational exposure, and differences in sex hormones that affects immune responses [13][14]

In the current study, the relationship between age and disease severity was positive. So, our research has proven that there is a relationship between age and severity of infection .

In our investigation showed that about 85 percent of patients were infected with the non-severe group, these results were agreeing with . Xie etal who showed that 80% of SARS-CoV-2 individuals may be asymptomatic or only mildly symptomatic, and about 10% experience severe respiratory symptoms [15].

Our finding suggest that the most severe patients have particular IgM and IgG antibody. Numerous studies demonstrate that during the SARS epidemic, antibodeis detection permitted for serological diagnosis [16]. Patients with COVID-19 have shown comparable serological responses, and the dynamic nature of these responses is compatible with acute viral infection

[17]. For the supplemental diagnosis of COVID-19, a quick and accurate test for SARS-CoV-2 antibodies is available [2]

Our results appear that both IgM and IgG were identified in patients' .

Many research appears during infection the specific antibodies is elevated in many patients, IgM appear during 3 days after infection as well as it detects as first line of defense immunity, after those responses of IgG are start and play an important role in long-term immune memory [18]

Our research appears that the platelet levels were high but within in normal range in patients these results agree with [19].

In our investigation, CRP levels were high significant (p< 0.003) in the SG (73.51±62.65, Table 2) compare with NSG , suggesting that CRP was a marker in severity and progression of this diseases. Our results agree with those of Yitbarek et al. and Wang et al., who found that SG had high significant CRP levels than NSG cases, signifying that CRP can be used to determine the extent of disease progression [8][20].

Serum ferritin levels in the SG (283.48±189.12 ng/l) , highly significant (p <0.000) compare to in NSG (121.9 ±155.3ng/l) as in Table 2. Ferritin is a bio marker of stored iron that increase in serum through infection [21][22].

ESR is an inflammatory factor that mostly detect the changes the types of protein in plasma [9]. ESR levels were also conducted to be great significantly (p< 0.000) in SG (69.83±41.77 mm/hr) to NSG (18.9±21.80 mm/hr) as in Table 2. Zeng et al. (2020), who conducted the ESR level was a high in the SG than in the NSG. There are many factors that may be the effect of this like acute inflammation and older ages [23].

Conclusion

In conclusion, the severity of disease correlates with specific immunologic and inflammatory response findings in hospitalized patients with COVID-19. Abstract Background: Emerging evidence have been suggesting that high levels of particluar antibodies may indicate poor chances of survival of COVID-19 disease. These biomarkers exhibited a distinct gradient relevant to disease progression, with an increase in severity also associated with older age. Increased inflammatory markers in patients with severe illness represent an enhanced systemic inflammatory response and immune dysregulation, and are helpful in risk stratification and prognostication in the clinical setting. Considered together, the assessment of serological markers (IgM and IgG) and common laboratory indices including CRP, ferritin, and ESR might improve early identification of patients at risk of severe outcomes and consequent timely therapeutic decisions. The current findings require validation in larger, multicenter cohorts with longitudinal designs to determine if the predictive capacity of these biomarkers can be integrated into standardized clinical severity scoring systems to manage the spectrum of disease seen in COVID-19.

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