



Research Paper

Role of C-reactive protein and its correlation with CT chest severity score in Coronavirus disease 2019 patients

Dr. Nupur Bapna 1 (PG), Dr. Sanjeev Narang 2 (HOD) , Dr. Romi Srivastava 3 (Associate professor), Dr. V.K Jain 4 (Professor) , Dr. Anjali Singh 5(Professor). Dr. Vatsal Chauhan 6 (PG)

Dept. of Pathology, Index Medical College Hospital & Research Centre, Indore ^{1,2,3,4,5,6}

ABSTRACT:

Aim and Objective -The purpose of this study was to determine C-reactive protein (CRP) level and its correlation with CT chest severity score (CTSS) as a diagnostic marker in assessing the severity and outcome of Coronavirus diseases patients. **Methodology** -Retrospective study, was carried out on 48 , real time reverse transcription polymerase reaction (RT-PCR) positive patients admitted in Index Medical College Hospital in the month of April- May 2021. The patients were divided into 3groups on the basis of C-reactive protein (CRP) value. Group 1 (CRP upto 25mg/dl), group 2 (CRP 26-100mg/dl) and group 3 (CRP above 100mg/dl). The chest CT severity score (CTSS) was categorised as mild (upto 8), moderate (9-15) and severe (above 15). Then, CRP and CTSS was compared by Fisher's test. **Result** -A total of 48 patients were included in this study. It was observed that high CRP level in Covid -19 patients were directly associated with severity of diseases. On comparing CRP value with CTSS , the maximum number of patients 28/48(58.3%) having severe CTSS were in the group 3 (CRP above 100mg) .**Conclusion** - This study signifies that CRP levels can predict the severity of disease and it's correlation with CTSS have good consistency in Covid-19. And combination of both can dynamically and effectively assess disease progression. These two diagnostic procedures have been found very helpful in management of Covid -19 disease .

KEYWORDS - CRP, CTSS, RT-PCR, Covid-19, Fisher's exact test

Received 08 Mar, 2022; Revised 20 Mar, 2022; Accepted 24 Mar, 2022 © The author(s) 2022. Published with open access at www.questjournals.org

I. INTRODUCTION :

In December 2019, patients with Coronavirus Disease 2019 (COVID-19) were first identified and diagnosed in Wuhan, Hubei province (1) . The coronaviruses belong to the β genus. They have envelopes, and the particles are round or oval, often polymorphic, with diameter being 60 to 140 nm. Their genetic characteristics are significantly different from SARS-CoV and MERS-CoV. Current research shows that they share more than 85% homology with bat SARS-like coronaviruses (bat-SL-CoVZC45). When isolated and cultured in vitro, the 2019-nCoV can be found in human respiratory epithelial cells in about 96 hours, however it takes about 6 days for the virus to be found if isolated and cultured in Vero E6 and Huh-7 cell lines. The virus is sensitive to ultraviolet and heat. Exposure to 56°C for 30 minutes and lipid solvents such as ether, 75% ethanol, chlorine-containing disinfectant, peracetic acid, and chloroform can effectively inactivate the virus. Chlorhexidine has not been effective in inactivating the virus (1) .The main clinical manifestations of COVID-19 patients mainly included fever, dry cough and fatigue, and the diagnosis was mainly based on the positivity of coronavirus nucleic acid detected by reverse transcription-polymerase chain reaction (RT-PCR). Severe cases of COVID-19 develop a hyperinflammatory response, leading to a pathological dysfunction of innate host defense systems. Complications include cytokine release syndrome (i.e., cytokine storm) and multiple organ failure. Fundamental to all pathologies is tissue damage, which, when severe enough, leads to organ dysfunction and death .C-reactive protein is a widely used diagnostic marker primarily used to assess ongoing inflammation. It is a key protein of the acute phase response, appears in blood within 6–10 hours of any tissue damaging event, has a plasma half-life of 19 hours, and is produced without a memory response. As CRP blood levels correlate with activation of the acute phase response, they represent a simple, rapid, and cost-effective way to assess the degree of tissue damage ongoing in that patient at the time of measurement (2).CT scores and serum C-reactive

protein (CRP) level have good consistency, and the combination of them can dynamically and effectively assess disease progression and therapeutic effects.

II. METHODS :

It is Retrospective study, was carried out on 48 , real time reverse transcription polymerase reaction (RT-PCR) positive patients admitted in Index Medical College Hospital in the month of April- May 2021. The patients were divided into 3groups on the basis of C-reactive protein (CRP) value. Group 1 (CRP upto 25mg/dl), group 2 (CRP 26-100mg/dl) and group 3 (CRP above 100mg/dl). The chest CT severity score (CTSS) was categorised as mild (upto 8), moderate (9-15) and severe (above 15) . CRP and CTSS was compared by Fisher's test .Aim - The purpose of this study is to determine C-reactive protein (CRP) level and it's correlation with CT chest severity score (CTSS) as a diagnostic marker in assessing the severity and outcome of Coronavirus diseases patients .Inclusion criterion All patients who were 20 years or older with COVID – 19 infection confirmed by RT –PCR. Exclusion criterion Age less than 20 years COVID infected Patients with comorbidities.

III. RESULTS :

TABLE 1: Table showing Gender distribution

Male	Female	Total
32	16	48

This study includes 32 males and 16 females COVID-19 affected patients

TABLE 2 : Table showing severity of cases on the basis of CRP level

S.No	CRP Level (mg/dl)	Severity of cases		
		Mild	Moderate	Severe
1	0-25	10	01	00
2	26-100	02	04	00
3	100-200	01	21	02
4	>200	00	04	03

This study shows that severity of disease was directly associated with CRP level , higher the CRP levels more the severity of disease.

TABLE 3: Table showing correlation of CRP level with CT scan severity score (CTSS)

S.No	CTSS	Group according to CRP level		
		Group I	Group II	Group III
1	Mild	6 (12.5%)	00	00
2	Moderate	2 (4.1%)	9 (18.75%)	3 (6.25%)
3	Severe	00	00	28 (58.3%)

It was found that majority of cases i.e 58.3% were in group III with severe CT score, 18.75% cases were in group II with moderate CT score and 12.5 % cases were in group I with mild CT score. Showing p <0.05 that is significant.

IV. DISCUSSION :

The number of patients with COVID-19 is currently rapidly increasing globally, and asymptomatic patients are also the source of infection (3) It is the first time for the COVID-19 to infect humans and can be transmitted from person to person . The incubation period can be 2 weeks and even longer. Besides, the virus can spread during the incubation period or recessive infection, which makes it difficult to identify those suspected cases without clinical symptoms for prompt control . COVID-19-related case fatality is also rapidly increasing. COVID-19 is a new threat for populations (4-6), and treatment options need to be evaluated (7).CRP levels are correlated with the level of inflammation, and its concentration level is not affected by factors such as age, sex, and physical condition (8).Matsumoto's study showed the value of CRP levels in

severe pneumonia (9). Tan et al. reported significantly increased CRP levels in initial stages of COVID-19 disease, with levels correlated with the severity of disease and the degree of internal tissue pathologies as measured using CT technology (10). This study also showed that, as the CRP levels increase, lung lesion also progressed. Hence CTSS increases. Zhang et al and Guan et al study had showed that, as the CRP level increases severity of COVID -19 disease increases (11,12). Wang et al had showed that C-reactive protein levels could reflect disease severity and should be used as a key indicator for disease monitoring (13). This study also showed that, as the CRP level increases severity and mortality of COVID -19 patients also increases.

V. CONCLUSION :

This study signifies that CRP levels can predict the severity of disease and its correlation with CTSS have good consistency in Covid-19. Combination of both can dynamically and effectively assess disease progression. These two diagnostic procedures have been found very helpful in management of Covid -19 disease .

REFERENCES :

- [1]. National Health Commission & State Administration of Traditional Chinese Medicine. *Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia (Trial Version 7)* Available at: <http://www.nhc.gov.cn/zyzj/s7653p/202003/46c9294a7df4cef80dc7f5912eb1989.shtml> . [PMC free article] [PubMed].
- [2]. Kim SH, Lee JY, Kim DH, Ham JH, Song YK, Lim EJ, et al. Factors related to the initial stroke severity of posterior circulation ischemic stroke. *Cerebrovasc Dis*. 2013;36(1):62–68. doi:10.1159/000351512. [PubMed] [Google Scholar].
- [3]. E. Machase China coronavirus: mild but infectious cases may make it hard to control outbreak Report warns BMJ (2020), p. 368:m325, 10.1136/bmj.m325edGoogle Scholar
- [4]. C. Wang, P.W. Horby, F.G. Hayden, G.F. Gao A novel coronavirus outbreak of global health concern *Lancet*, 395 (10223) (2020), pp. 470–473, 10.1016/S01406736(20)30185-9 ArticleDownload PDFCrossRefView Record in ScopusGoogle Scholar
- [5]. M. Bassetti, A. Vena, D.R. Giacobbe The novel Chinese coronavirus (2019-nCoV) infections: challenges for fighting the storm *Eur J Clin Invest*, 50 (3) (2020), 10.1111/eci.13209 [1320913213] Google Scholar
- [6]. X. Xu, P. Chen, J. Wang, J. Feng, H. Zhou, X. Li, et al. Evolution of the novel coronavirus from the ongoing Wuhan outbreak and modeling of its spike protein for risk of human transmission *Sci China Life Sci*, 63 (3) (2020), pp. 457–460, 10.1007/s11427-020-1637-5
- [7]. R.L. Kruse Therapeutic strategies in an outbreak scenario to treat the novel coronavirus originating in Wuhan, China *F1000Research*, 9 (2020), p. 72, 10.12688/f1000research.22211.2
- [8]. O. Bilgir, F. Bilgir, M. Calan Comparison of pre-and post-levothyroxine high-sensitivity C-reactive protein and fetuin-A levels in subclinical hypothyroidism *Clinics*, 70 (2) (2015), pp. 97–101, 10.6061/clinics/2015(02)05 .
- [9]. H. Matsumoto, T. Kasai, A. Sato, S. Ishiwata, S. Yatsu, J. Shitara, et al. Association between C-reactive protein levels at hospital admission and long-term mortality in patients with acute decompensated heart failure *Heart Vessels*, 34 (12) (2019), pp. 1961–1968, 10.1007/s00380-019-01435-9
- [10]. Tan C, Huang Y, Shi F, Tan K, Ma Q, Chen Y, Jian X, Li X, 2020. C-reactive protein correlates with CT findings and predicts severe COVID-19 early. *J Med Virol* 92: 856–862. [PMC free article] [PubMed] [Google Scholar]
- [11]. Wang L, 2020. C-reactive protein levels in the early stage of COVID-19. *Med Mal Infect* 50: 332–334. [PMC free article] [PubMed] [Google Scholar]
- [12]. Zhang JJ, Dong X, Cao YY, Yuan YD, Yang YB, Yan YQ, Akdis CA, Gao YD, 2020. Clinical characteristics of 140 patients infected with SARS-CoV-2 in Wuhan, China. *Allergy* 10.1111/all.14238. Epub ahead of print, Feb 19. [PubMed] [CrossRef] [Google Scholar]
- [13]. Wang L, 2020. C-reactive protein levels in the early stage of COVID-19. *Med Mal Infect* 50: 332–334. [PMC free article] [PubMed] [Google Scholar]