Original Research Paper

Pathology

ANALYSIS OF ROUTINE LABORATORY PARAMETERS IN COVID 19 PATIENTS – A HOSPITAL BASED STUDY IN LOWER ASSAM.

Dr. B Datta	Associate professor, Department of Pathology, Fakhruddin Ali Ahmed Medical College & Hospital, Barpeta, Assam.
Dr. Nirmali Mattack*	Post Graduate Trainee, Department of Pathology, Fakhruddin Ali Ahmed Medical College & Hospital, Barpeta, Assam. *Corresponding Author

ABSTRACT

Background: Novel coronavirus (COVID-19) may lead to a spectrum of clinical presentations ranging from mild flu like symptoms to severe respiratory distress. Early diagnosis is very important for isolation and treatment. We tried to extract information by analyzing the covid-19 laboratory findings, so as to provide help for clinical practice.

Method: We analysed the hematology data of 170 COVID-19 positive patients attending a tertiary health care centre of Lower Assam, India.

Result: Among the 170 patients with COVID- 19, 23 (14%) and 14 (8%) patients showed decreased lymphocyte count and lymphocyte ratio respectively, 2(1%) showed eosinopenia and 20(12%) patients showed increased eosinophil count.

Conclusion: We showed that the laboratory findings of COVID-19 in confirmed pneumonia patients were very different and conflicting. In our study group, lymphopenia was common along with variable changes in the eosinophil count.

KEYWORDS :

INTRODUCTION:

For around a year now, the world has been fighting a pandemic disease caused by a novel coronavirus which emerged in Wuhan, Hubei, China at the end of December 2019, named as severe acute respiratory syndrome coronavirus 2 (SARSCoV- 2). [1] The disease is sustained by a novel coronavirus named COVID-19 by the World Health Organization. Till date, the epidemic has gradually spread to 208 countries worldwide with almost 1.5 million infected people and more than 70,000 deaths, [2] both of which are rapidly increasing. The disease urged governments to take drastic measures like the quarantine of hundreds of millions of residents worldwide. However, because of the COVID-19 symptomatology, which showed a large number of asymptomatics, [3] these efforts are limited by the problem of differentiating between COVID-19-positive and -negative individuals.

Although detection of viral nucleic acid using real-time reverse-transcription polymerase chain reaction (RT-PCR) remains the gold standard of diagnosis and monitoring, it is very time-consuming and has a high prevalence of false-negative results. [4,5] Other laboratory tests, such as whole white blood cells (WBCs) count, neutrophil ratio, lymphocyte count, C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), hemoglobin, platelets, procalcitonin, creatine kinase (CK), myoglobin, aspartate aminotransferase (AST), alanine aminotransferase (ALT), total bilirubin, creatinine, cardiac troponin I, D-dimer, albumin, lactate dehydrogenase (LDH) and several other laboratory tests have been reported to change in COVID-19 patients. [6-9]

Since the laboratory medicine plays an essential role to the clinical decision making in many infectious diseases including COVID-19, we analysed the Complete blood count of COVID-19 patients to provide a data in order to contribute to the laboratory-based diagnosis and monitoring of COVID-19 patients.

MATERIALS AND METHODS:

This cross sectional study was carried out in a tertiary health care centre, Fakhruddin Ali Ahmed Medical College, of Lower Assam, India from April, 2020 to October, 2020. Ethical clearance by the institution Ethical Committee was granted and informed consent from the participants was obtained. COVID 19 status was determined by RT-PCR. The RT-PCR was performed on a Biorad CFX 96 thermocycler using the NIV Multiplex 2019-nCoV Real-Time Reverse Transcription PCR Kit. RNA purification was performed using the Zybio kit.170 COVID 19 positive patients admitted in the hospital were analysed for their Complete blood counts in cell counter SYSMEX XS-800i and Peripheral blood smears were evaluated whenever necessary. Microsoft Excel worksheet was used for statistical analysis of the data.

RESULTS:

Of the 170 patients, maximum patients were in the age group 21 to 30 years (Figure 1) accounting to 53 patients with least number of patients in the age group 81 to 90 years. Male patients comprised of 138 and female patients comprised of 32 patients (Figure 2). 21% of the patients were of Hindu religion and 79% were of Islamic origin.
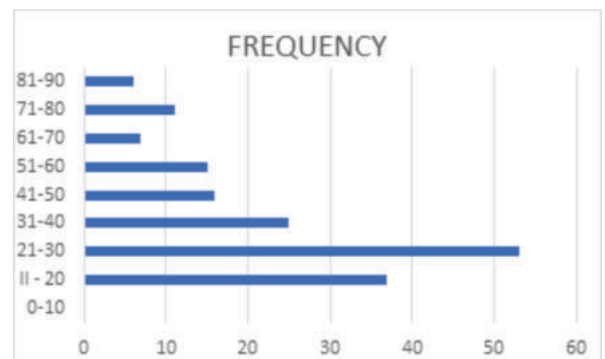

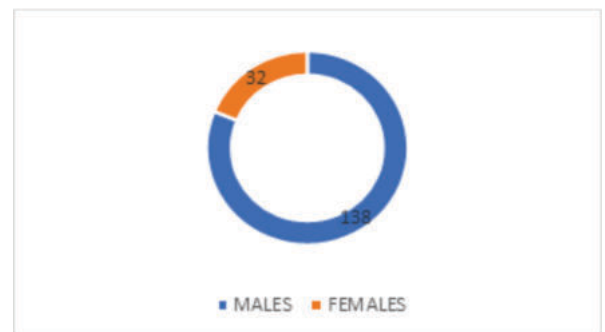Fig 1: Showing frequency of patients in different age groups.

Fig 2: Showing gender distribution in COVID 19 positive patients.

68 patients (40%) showed neutropenia, 23 patients(13.5%) showed lymphopenia, 14 patients(8%) showed decreased NLR, 2 patients(1%) showed eosinopenia whereas 20 patients(12%) showed eosinophilia. 20 (12%) of the patients showed thrombocytopenia. 34% patients had mild anemia, 5% had moderate and 3% had severe anemia. In blood grouping, highest number of patients had blood group O positive (35%), followed by A positive (23%), B positive (31%), AB positive (7%), B negative (3%) and A negative (1%).

DISCUSSION:

The maximum patients were of the age group 21-30 years which might account to the fact that this age group went outdoors the most and hence got infected more frequently. COVID-19 shows an increased

number of cases and a greater risk of severe disease with increasing age,[10,11] a feature shared with the 2003 SARS epidemics.[12] This age gradient in reported cases, which has been observed from the earliest stages of the pandemic, [13] , could result from children having decreased susceptibility to infection, a lower probability of showing disease on infection or a combination of both, compared with adults. The role of age in transmission is critical to designing interventions aiming to decrease transmission in the population as a whole and to projecting the expected global burden.

Males were more affected than females, again emphasising that males tend to go outdoors more frequently and get infected. The relative importance of sex-linked disease resistance and differential attack rates needs to be clarified with follow up studies.

The reason behind Muslims being more affected is because the hospital in which the study was carried is located in a Muslim dominated area of Lower Assam as supported by the census on Barpeta population. Cytotoxic T lymphocytes and natural killer cells are necessary for the control of viral infection. A functional exhaustion of antiviral lymphocytes is reported in COVID-19 patients. [14] However, there is still limited evidence for the predictive role of lymphocyte count in predicting the severity of COVID-19. Cytotoxic T lymphocytes and natural killer cells are necessary for the control of viral infection. A functional exhaustion of antiviral lymphocytes is reported in COVID-19 patients. [14] However, there is still limited evidence for the predictive role of lymphocyte count in predicting the severity of COVID-19. It is suggested that SARS-CoV-2 might mainly act on lymphocytes, especially T lymphocytes, as does SARS-CoV. Virus particles spread through the respiratory tract and infect other cells, inducing series of immune responses, and causing changes in number of peripheral white blood cells such as lymphocytes . Some studies suggest that a substantial decrease in the total number of lymphocytes indicates that coronavirus affects many immune cells and inhibits cellular immune function. [15] Previous studies observed that lymphopenia is a common observation in patients with severe acute respiratory syndrome (SARS) caused by SARS virus with reported prevalence of 69.6%- 54%. [16,17] Lymphopenia is quite notable in SARS infection. [18] SARS infection may either directly suppress bone marrow or induce an immune mediated destruction of lymphocytes resulting in lymphopenia. [19] SARS-COV-2 might share a similar inner mechanism with SARS virus, including direct infection and destruction of lymphocytes [15] and cytokine mediated lymphocyte destruction. [20]

With the increase of the COVID-19 research, we have seen some reports of eosinopenia. However, compared with the published literature, our study found that the proportion of eosinophil changes was low with 12% showing a decrease in eosinophil count. This may be related to our research object is the COVID-19 screening patients, these patients are in the early stage of the disease, the body's emergency response is more intense, so the decline of eosinophils is faster. But, the relationship between eosinophils and disease severity needs further study.

Neutrophils are one of the human body's vital immune cells. When pathogenic microorganisms invade the body, immune cells tend to rapidly chemotactically gather to the infection site and play the role of host defence and immune regulation. When the body's neutrophils are significantly reduced, the body's immunity is compromised, and thus the risk of infection is significantly increased. Lymphocytes are the main effector cells of the human immune response. The number of lymphocytes in the body is closely related to the body's immunity and defence system against pathogenic microorganisms and is negatively correlated with the degree of inflammation. NLR encompasses two types of leukocyte subtypes, reflecting the balance of the body's neutrophil and lymphocyte count levels and the degree of systemic inflammation. More accurately, it reflects the balance between the severity of the inflammation and the body's immunity status, and is thus considered an important marker of systemic inflammatory response. Based on this, we speculated that heavy COVID-19 infection can have significant systemic inflammation and that NLR may have a role in predicting the infection's severity. [21]

CONCLUSION:
There is a crucial need to better recognize the full laboratory spectrum of COVID-19 in the different populations in order to help early diagnosis of the disease. This study aimed to describe the COVID-19 laboratory findings in adults in order to provide an insight about the diagnosis of the disease. We showed that the laboratory findings of COVID-19 confirmed pneumonia patients were very different and conflicting, however, some tests are attracting more attention. In our study group, lymphopenia was common along with variable changes in the eosinophil count. Further studies on laboratory findings in COVID 19 need to be conducted in Northeast India so as to aid in the diagnosis and treatment of the disease.

REFERENCES:
1. Gorbalenya, A.E., Baker, S.C. The species severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. Nat Microbiol 2020;5:536–544.
2. Ferrari D, Motta A, Strollo M, Banfi G, Locatelli M. Routine blood tests as a potential diagnostic tool for COVID 19. Clin Chem Lab Med 2020.
3. Day M. Covid-19: identifying and isolating asymptomatic people helped eliminate virus in Italian village. Br Med J 2020;368.
4. Liu K, Chen Y, Lin R, Han K. Clinical features of COVID-19 in elderly patients: A comparison with young and middle-aged patients. Journal of Infection 2020.
5. Lippi G, Simundic A-M, Plebani M. Potential preanalytical and analytical vulnerabilities in the laboratory diagnosis of coronavirus disease 2019 (COVID-19). Clinical Chemistry and Laboratory Medicine (CCLM) 2020; 1(ahead-of-print).
6. Lippi G, Plebani M. Laboratory abnormalities in patients with COVID-2019 infection. Clinical Chemistry and Laboratory Medicine (CCLM) 2020; (0): 20200198.
7. Jin Y-H, Cai L, Cheng Z-S, Cheng H, Tong D, Yi Pin F et al. A rapid advice guideline for the diagnosis and treatment of 2019 novel coronavirus (2019-nCoV) infected pneumonia. Military Medical Research 2020; 7(1): 4.
8. Lippi G, Plebani M. Procalcitonin in patients with severe coronavirus disease 2019 (COVID-19): a meta-analysis. Clinica Chimica Acta; International Journal of Clinical Chemistry 2020.
9. Fan BE, Chong VCL, Chan SSW, Lim GH, Lim KGE, Tan GB et al. Hematologic parameters in patients with COVID-19 infection. Am J Hematol. 2020 Jun;95(6): E131-E134.
10. Dong, Y, MO X, HU y. Epidemiological characteristics of 2,143 pediatric patients with 2019 coronavirus disease in China. The Journal of Emergency Medicine 2020. vol. 58,4: 712–713.
11. Zhao, X, Li P, Zheng B. Incidence, clinical characteristics and prognostic factor of patients with COVID-19: a systematic review and meta-analysis. Preprint at http://medrxiv.org/lookup/doi/10.1101/2020.03.17.20037572 (2020).
12. Anderson R, Fraser C, Ghani A, Donnelly C, Riley S, Ferguson N et al. (2004). Epidemiology, transmission dynamics and control of SARS: The 2002-2003 epidemic. Philosophical transactions of the Royal Society of London. Series B, Biological sciences. 359. 1091-105. 10.1098/rstb.2004.1490.
13. Liu, Z., Xing, B. & Xue Za, Z. The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19) in China. Chin. J. Epidemiol 2020. 41, 145–151 .
14. Zheng HY, Zhang M, Yang CX, Zhang N, Wang XC, Yang XP et al. Elevated exhaustion levels and reduced functional diversity of T cells in peripheral blood may predict severe progression in COVID-19 patients. Cell Mol Immunol 2020.
15. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. The Lancet. 2020;395(10223):507-513.
16. Lee N, Hui D, Wu A, Chan P, Cameron P, Joynt GM et al. A major outbreak of severe acute respiratory syndrome in Hong Kong. N Engl J Med 2003;348:1986–1994.
17. Booth CM, Matukas LM, Tomlinson GA, Rachlis AR, Rose DB, Dwosh HA et al. Clinical features and short-term outcomes of 144 patients with SARS in the greater Toronto area. Jama 2003;289:2801–2809.
18. Yang M, Li CK, Li K, Hon KLE, Ng MHL, Chan PKS et al. Hematological findings in SARS patients and possible mechanisms (review). Int J Mol Med 2004;14:311–315.
19. He Z, Zhao C, Dong Q, Zhuang H, Song S, Peng G et al. Effects of severe acute respiratory syndrome (SARS) coronavirus infection on peripheral blood lymphocytes and their subsets. Int J Infect Dis 2005; 9:323–330.
20. Zheng M, Gao Y, Wang G, Song G, Liu S, Sun D et al. Functional exhaustion of antiviral lymphocytes in COVID-19 patients. Cell Mol Immunol 2020.
21. Imran MM, Ahmed U, Usman U, Ali M, Shaukat A, Gul N, 'NLR- A marker of COVID 19 Pneumonia Severity; doi:10.1111/IJCP.13698.