

ORIGINAL ARTICLE

Laboratory parameters of COVID-19 patients in Khulna, Bangladesh

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Abstract

Background: Recent studies have demonstrated the role of several laboratory tests in addition to RT-PCR in the diagnosis of COVID 19. Some of these, laboratory tests are indicators of the current state of the disease, while others have proved to be useful prognostic markers.

Objective: The objective of our study was to evaluate the hematological, biochemical and radiological changes in COVID-19 patients.

Methods: It was an observational and analytical study done retrospectively. The whole number of patients were included on the basis of inclusion and exclusion criteria. All were confirmed cases of COVID-19 patients either admitted in different hospitals or were in home isolation.

Results: Total study cases was 112. Complete blood count revealed, leukocytosis was present in 9 (8.0%) cases and leucopenia in 8 (7.14%) cases. Neutrophilia was present in 27 (24.1%) cases; neutropenia in 9(8.0%) cases, lymphocytosis in 17 (15.2%) cases; lymphopenia in 28 (25%) cases. Neutrophil Lymphocyte ratio (NLR) revealed mean value of NLR 2.3(±1.1) with a range of 0.6-4.0. Decreased total circulating eosinophil count (<40/cmm) was found in 6 (5.3%) cases. Thrombocytopenia was found in 31 (27.7%) cases, Elevated ESR was found in 53 (47.3%) cases; CRP value was increased in 47 (42.0%) cases. Increased serum ferritin was found in 29 (25.9%) cases. D-dimer was increased in 35 (31.3%) cases; Xray chest showed bilateral pneumonia in 26 (23.2%) cases. High resolution computed tomography (HRCT) of chest revealed ground glass opacities in 11(9.8%) cases.

Conclusion: Multiple changes in laboratory findings were observed such as altered NLR, elevated acute phase reactants, increased seromarkers (S ferritin, D-dimers) and also opacities in chest imaging.

Keywords: COVID-19, D-dimer, Thrombocytopenia

Introduction

The current pandemic COVID-19 has been spread rapidly and till now affected 216 countries.¹ Till August 23, 2020 total 23,057,288 cases have been diagnosed worldwide and 800,906 confirmed deaths has occurred.¹ In Bangladesh first case was detected at 8th March, till August 23,2020, total 294,598 cases diagnosed and 3,941 confirmed deaths occurred.²

Coronavirus infections were typically asymptomatic or associated with mild respiratory symptoms. The first severe coronavirus was the Severe Acute Respiratory Syndrome virus (SARS), which was appeared in the Guangdong province of southern

China in 2002, there were 8,098 reported cases and 774 deaths.^{3,4} In Saudi Arabia in 2012, the Middle East respiratory syndrome coronavirus (MERS-CoV) caused 2,458 infections with 848 deaths.^{5,6}

In December 2019, the new COVID-19 coronavirus was identified in Wuhan of china. The first reports of respiratory illness were from people who worked or lived in the Huanan seafood wholesale market in Wuhan.^{7,8} This Novel Coronavirus was named severe acute respiratory syndrome-coronaviruses 2 (SARS-CoV-2) by the International Committee on Taxonomy of Viruses (ICTV), and the World Health Organization (WHO) announced COVID-19

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(coronavirus disease) as the name of this new disease on February 2020.⁹

Recent studies have suggested the role of primary laboratory tests in addition to clinical symptoms for suspected patients, which play a significant role in the diagnosis of COVID-19. The Laboratory investigation is also important for follow up as well as to see the prognosis. In the COVID-19 pandemic, the involvement of several biomarkers as indicators of the current state of the disease has been reported, while others have proved to be useful prognostic markers. Therefore, the present study was conducted to evaluate the laboratory findings in COVID-19 patients in Khulna, Bangladesh.

Materials and methods

It was a retrospective, observational and analytical study. The whole number of patients included in our study was 112 (n=112). Study period was from March 2020 to August 2020. One hundred and twelve confirmed cases of COVID-19 patients, admitted in COVID dedicated hospital in Boyra Khulna, Flu corner, Khulna Medical College Hospital Khulna and also patients in home isolation were taken into account by purposive sampling method.

All patients were positive with real time polymerase chain reaction (RT-PCR) for COVID-19. Clinical profile of every patient was recorded regarding age, sex and symptoms- fever, cough, shortness of breath (SOB), sore throat, headache, bodyache. anosmia. Investigation reports of the patients like complete blood count, Erythrocyte sedimentation rate (ESR), CRP, S ferritin, D-dimer. X-ray chest P/A view, high resolution CT scan of chest done from reliable investigation centres were collected. These reports were analysed using SPSS.

Inclusion criteria for the study cases were

- i) RT-PCR for COVID -19 Positive and.
- ii) Investigations done from reliable investigation centres

Exclusion criteria were

- i) Suspected co-infection.
- ii) Suspected secondary bacterial infection
- iii) Investigations done from non-reliable investigation centres

Results

Mean age of our patients was 53.5 ± 10.1 years with range of 23-89 years. Male and female ratio was 2.6:1. Fever was the most common (92.0%)

symptom followed by cough (73.2%) & headache /body ache (69.6%) (Table -I).

Table I
Symptoms of COVID-19

Symptoms	No	Percentage
Fever	103	92.0
Cough	82	73.2
Headache /Bodyache	78	69.6
Sore throat	60	53.6
Anosmia	56	50
SOB (Shortness Of Breath)	41	36.6
Diarrhea	40	35.7

Complete blood count revealed mean Hb 11.9 ± 1.9 gm/dl with a range of 8.6-15.3 gm/dl. Total count of WBC revealed mean value 8881 ± 2703 /cmm with a range of 4530-13300/cmm; Leukocytosis (> 11000 /cmm) was present in 9 (8.0%) cases and leucopenia. (< 4000 /cmm) in 8 (7.1%) cases. (Table-II)

Table II
Total Count of WBC

TC (/cmm)	No	Percentage
< 4000	8	7.1
4000-11000	95	84.8
> 11000	9	8.0

Neutrophil count revealed mean value of $62.9 (\pm 12.7)\%$ with range of 35-77%; Neutrophilia was present in 27 (24.1%) cases; neutropenia in 9 (8.0%) cases. Lymphocytes count revealed mean value of $31.8 (\pm 12.0)\%$ with range 13-57%; lymphocytosis in 17(15.2%) cases; lymphopenia in 28 (2%) cases.

Neutrophil Lymphocyte ratio (NLR) revealed mean value of NLR 2.3 ± 1.1 with a range of 0.6-4.1. Mean Total Circulating Eosinophil (TCE) count was found 102/cmm with range of 30-190/cmm; decreased total circulating eosinophil count (< 40 /cmm) was found in 6 (5.4%) cases. Plateleted count revealed mean $2,50,000 \pm 7,8910$ /cmm with a range of 1,32,000-3,38,000/cmm; Thrombocytopenia ($< 1,50,000$ /cmm) was found in 31 (27.7%) cases.

Mean ESR was 34.3 ± 27.3 mm in 1st hour with a range of 7-100 mm at 1st hour; elevated ESR was found in 53 (47.3%) cases; ESR value more than 50 mm in 1st hour was found in 6 (5.4%) cases. Mean

CRP was 19.6 ± 17.4 mg/L with a range of 0.5-139 mg/L. CRP value was normal in 65 (58.0%) cases and increased in 47 (42.0%) cases. Serum ferritin was found to be of mean value of 277 ± 347 ng/ml with a range 7.3-1074 ng/ml; Increased serum ferritin was found in 29 (25.9%) cases.

Table III
D-dimers level in COVID-19 patients

D Dimers (mg/l)	No	Percentage
<0.5	47	42.0
0.5-1	24	21.4
>1	11	9.8

D-dimers, was found of mean value of 0.4 ± 0.5 mg/l with a range of 0.2-1.8 mg/l. D Dimer was normal (<0.5 mg/L) in 47(42.0%) cases; increased in 35 cases (31.2%) (Table III).

Table IV
Lung area Involvement in HRCT
(High Resolution CT Scan)

Lung area involved	No	Percentage
< 50%	6	5.4
50-75%	3	2.7
> 75%	2	1.8

X-ray chest showed Bilateral pneumonia in 26 (23.2%) cases. HRCT of chest revealed ground glass opacities in 11(9.8%) cases (Table IV).

Discussion

COVID-19 belongs to the Coronaviridae family and is the newest serious zoonotic virus after the related viruses SARS and MERS. Prior to 2002, coronaviruses, were associated with mild respiratory illness, but with the emergence of SARS in 2002, MERS in 2012, and now in late 2019, COVID-19, establishes that coronaviruses, can be associated with severe respiratory disease.^{10,11}

Early diagnosis, isolation, and prompt treatment is necessary for better outcome in COVID-19. Currently RT-PCR based technique is used to confirm the cases. Upper respiratory specimen (nasopharyngeal) is used to detect SARS-CoV-2 in our country but the facility is not available countrywide. Serological detection (antigen and antibody) is not being used in our country. Chest

X-ray showing bilateral infiltrates and in computed tomography (CT) chest ground-glass opacities are said to be characteristic. We have to depend on CBC and Chest imaging for diagnosis in many areas of the country. Also, serum ferritin, CRP, D-dimer are used for assessment of severity.

In this study, Leukocytosis (>11,000/cmm) was present in 9(8.1%) cases, leucopenia in 8(7.1%) cases, lymphocytosis in 17(15.2%) cases and lymphopenia in 28(25%) cases. Decreased total circulating eosinophil count (<40/cmm) was found in 6(5.4%) cases. Thrombocytopenia (<1,50,000/cmm) was found in 31(27.7%) cases. Similar results are found in a study from china.¹² In another study lymphopenia was the most common laboratory finding in COVID-19, and was found in as many as 83% of hospitalized patients.¹³ Decreased eosinophils (58.4%, 95% CI 46.5-69.8%) and lymphopenia, (47.9%) was found in another study from China.¹⁴

In this study, elevated ESR was found in 53 (47.3%) cases; ESR value more than 50 mm in 1st hour in 6 (5.3%) cases and CRP was increased in 47 (42.0%) cases. CRP was increased in 79% cases in a meta-analysis.¹² Increased C reactive protein (CRP; 73.6%, 95% CI 65.0-81.3%), increased erythrocyte sedimentation rate (61.2%, 95% CI 41.3-81.0%), were found in several other studies.^{14,15}

Serum ferritin level was increased in 29(25.9%) cases. In a study the clinical characteristics of 99 patients were analysed, in which 63(63.6%) of them had serum ferritin value above the normal range.¹⁶ D-dimer was elevated in 49.1% cases. D-dimer elevation (>0.5mg/L) was seen in 74.6% (185/248) of the patients in a study.¹⁷

CXR showed Bilateral pneumonia in 26(23.2%) cases. HRCT of chest revealed Ground glass opacities in 11 (9.8%) cases with lung involvement. Analysis in China showed that the most common abnormality in Chest X ray and CT are bilateral involvement of chest in 81% (95% CI 62.5-87, $p < 0.001$), consolidation 73.5% (95% CI 50.5-91, $p < 0.001$), and ground glass opacity 73.5% (95% CI 40-90, $p < 0.001$).¹² One study found that 56% of patients who presented within two days of diagnosis had a normal CT of Chest.^{18,19}

Our study is limited by several factors. Sample size was small in regards to pandemic. Moreover, we couldn't follow up the patients which could enable us to differentiate between the laboratory features of survivors and non-survivors.

Conclusion

As a new disease, clinical and laboratory parameter of COVID-19 are accumulating with time. Changes in NLR, acute phase reactants as well as raised S ferritin and D-dimer in COVID-19 patients were found. Opacities in chest images were also found in this study.

References

1. WHO; Coronavirus Disease (COVID-19) Update Bulletin; 23 Aug, 2020
2. WHO Bangladesh COVID-19 morbidity and mortality weekly update 17 August 2020
3. Cheng VC, Lau SK, Woo PC, Yuen KY. Severe acute respiratory syndrome coronavirus, as an agent of emerging and reemerging infection. *Clin Microbiol Rev.* 2007; 20: 660-94
4. Lam W, Zhong N, Tan W. Overview on SARS in Asia and the world. *Respirology* 2003; 8: S2-S5
5. Farooq HZ, Davies E, Ahmad S, Hesketh L, Guiver M, Turner AJ, et al. Middle East respiratory syndrome coronavirus (MERS-CoV) Surveillance and testing in North England from 2012 to 2019. *International Journal of Infectious Diseases*, 2020; 93: 237-44
6. Zheng J, Hassan S, Alagaili AN, Alshukairi AN, Amor NM, Mukhtar N. Middle East respiratory syndrome coronavirus seropositivity in camel handlers and their families, Pakistan. *Emerg Infect Dis* 2019; 25: 2307
7. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J. A novel coronavirus from patients with pneumonia in China. *N Engl J Med* 2020; 382: 727-733
8. Chan JF, Yuan S, Kok KH, To KKW, Chu H, Yang J, et al. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person to person transmission: a study of a family cluster. *Lancet.* 2020; 395; 514-523
9. World Health Organization (WHO); Laboratory testing for coronavirus disease 2019 (COVID-19) in suspected human cases. Interim guidance; 2 March 2020
10. Ji W, Wang W, Zhao X, Zai J, Li X. Homologous recombination within the spike glycoprotein of the newly identified coronavirus may boost cross species transmission from snake to human. *J Med Virol.* 2020; 92; 433-440
11. Sun P, Qie S, Liu Z, Ren J, Xi J. Clinical Characteristics of 5732 Patients with 2019 nCoV Infection, 2020. (<https://ssrn.com/abstract=3539664>) (Accessed 17 March, 2020)
12. Sun S, Cai X, Wang K He G, Lin Y, Lu B, et al. Abnormalities of peripheral blood system in patients with COVID 19 in Wenzhou, China. *Clin Chim Acta.* 2020; 507:174-80
13. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX et al. Clinical Characteristics of Coronavirus Disease 2019 in China. *N Engl J Med* 2020; 382:1708-20.
14. Zhang ZL, Hou YL, Li DT & Li FZ: Laboratory findings of COVID 19: a systematic review and meta analysis, *Scandinavian Journal of Clinical and Laboratory Investigation* 2020; 59; 1502-07
15. Ruan Q, Yang K, Wang W, Jiang L, Song J. Clinical predictors of mortality due to COVID-19 based on an analysis of data of 150 patients from Wuhan, China. *Intensive Care Med* 2020; 46: 846-8
16. 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. *Lancet* 2020; 395: 507-13
17. Tang N, Bai H, Chen X., Gong J, Li D, Sun Z. Anticoagulant treatment is associated with decreased mortality in severe coronavirus disease 2019 patients with coagulopathy. *J Thromb Hamost* 2020; 18; 1094-1099
18. Shi H, Han X, Zheng C. Evolution of CT Manifestations in a Patient Recovered from 2019 Novel Coronavirus (2019 nCoV) Pneumonia in Wuhan, China. *Radiology* 2020; 295: 20
19. Xu X, Yu C, Qu J, Zhang L, Jiang S, Huang D, et al. Imaging and clinical features of patients with 2019 novel coronavirus SARS-CoV-2. *Eur J Nucl Med Mol Imaging* 2020; 47:1275-80