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Haematological parameters and SARS-CoV-2 RT PCR positivity among patients at fever clinic in a tertiary care hospital in Bangladesh

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Article Info

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Abstract

The COVID-19 pandemic has had a consequential impact on the global health system. Multisystem involvement is common in COVID-19. Many COVID-19 patients also showed changes in haematological parameters. This cross-sectional study included patients who attended the fever clinic of Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, with fever and/or upper respiratory symptoms. Demographic information, information regarding symptoms, exposure and comorbidities were collected. Complete blood count profile and C-reactive protein were done. Patients underwent RT-PCR for Covid-19 at the fever clinic. A total of 350 patients were included in the study. The study revealed that 21.4% of respondents were COVID-19 positive. PCR-positive patients were more likely to be symptomatic and had elevated C reactive protein levels. COVID-19 positive patients also showed higher total leucocyte, neutrophil, lymphocyte, eosinophil, basophil, and platelet count.

Introduction

COVID-19 pandemic has been caused by the Severe Acute Respiratory Syndrome – Coronavirus 2 (SARS-CoV-2) virus. The disease was first reported in China in late 2019, but within a short period, it had reached most countries and territories in the World.[1, 2] Health authorities across countries struggled to contain the spread of the pandemic and simultaneously manage a large number of patients with the potentially fatal disease due to its little-known pathogen. Infection control and prevention (IPC) is important in combatting the pandemic. Many strategies have been implemented to reduce disease transmission in health care facilities. Dedicated facilities for treating COVID-19 patients had been set up existing facilities designated special corners for managing COVID-19 patients. Triage corners were established to screen and group patients into confirmed, suspected, and non-infected patients in most healthcare facilities. Fever clinics were also set up in some facilities as specialized clinics for patients with fever and/or upper respiratory symptoms. These clinics offered clinical consultation, basic haematological and biochemical investigations and Reverse Transcriptase Polymerase Chain Reaction (RT PCR) based on patients' requirements.

Despite being primarily a disease of the respiratory system, Coronavirus Disease - 2019 (COVID-19) may cause other systemic complications during its initial presentation or later during the course of the disease.[3] The study explored clinical features, haematological changes of the patients and their potential relationship with the RT PCR positivity for COVID 19.

Methods

This descriptive cross-sectional study included patients who attended the fever clinic in a tertiary care facility in Bangladesh in the early months of the pandemic. All the study participants received the RT-PCR test for COVID-19 at the clinic. A total of 350 patients were included in this study. Complete Blood Count (CBC) and C- reactive protein (CRP) levels were measured on the

same day the samples were taken. The analysis of symptoms, haematological findings, and CRP levels among the fever clinic attendees and their relationship with RT PCR status was carried out using the statistical software - SPSS (Statistical Package for Social Sciences) version 26.

Results

A total of 350 persons attending the fever clinic were included in the study. Among the respondents, majority (64.6%) were aged between 20 and 39 years. Around 26% belonged to the 40-59 years age group. Only 6% were aged 60 years or more. Age distribution was similar across COVID-19 positive and negative groups; mean (sd) age (in years) was 39.1 (11.05) vs. 36.3 (12.17). Mean BMI among COVID positive and negative patients was also similar; BMI (kg/m2) 30.5 (4.93) vs. 30.9 (3.97). Among all the participants, 4.9% were obese and another 31% were overweight (Table– I).

Majority (69.7%) of the participants were male. About one-fourth of respondents were healthcare workers. More than 30% had one or more relevant comorbidities. More than 10% of the respondents were active smokers. Among the respondents, 83.8% were symptomatic. Among them, 21.4% were found to be positive for SARS-CoV2 RNA by RT-PCR. Symptomatic patients were much more likely to be tested positive for COVID-19 (24.5% vs 5.4%, p = 0.001). Patients with elevated CRP were also more likely to be positive for COVID-19 (28.8% vs 18.7%, p = 0.035) (Table– II).

Symptomatic patients were much more likely to be tested positive for COVID-19 (24.5% vs 5.4%, p = .001). The most common symptoms were fever (63.6%) and cough (45.9%). Patients with fever (p = .001), cough (p=.049), and anosmia (p=.001) were significantly more likely to be positive for COVID-19 (Table – III).

As many as 87.1% of respondents were recipients of some form of exposure, most commonly through occupational exposure (57.7%) or through exposure to affected family members (57.4%). At least one comorbidity was present in 30.9% of study participants. Hypertension (15.4%), diabetes (11.8%), and asthma (3.9%) were the most common comorbidities. Among all the participants, 2% were pregnant. Complete blood count (CBC) revealed that COVID-19-positive patients had higher total leucocyte, neutrophil, lymphocyte, eosinophil, basophil, and platelet counts ($p < .05$).

Table-I

Age and Body Mass Index (BMI) of participants and their COVID-19 status

Variable	COVID-19		p-value*
	Positive (n=76)	Negative (n=278)	
Age (years) (Mean±SD)	39.1 (± 11.05)	36.3 (± 12.17)	0.072
BMI (kg/m^2) (Mean±SD)	30.5 (± 4.93)	30.9 (± 3.97)	0.464

**significance at 5% level, t-test*

Table-II

CRP level and COVID-19 status among study participants

		COVID-19		Total
		Positive, n (%)	Negative, n (%)	
CRP	Elevated	30 (28.8)	74 (71.2)	104
	Normal	46 (18.7)	200 (81.3)	246
	Total	76	274	350

Table-III

Presenting symptoms and COVID-19 status of the study participants

Symptoms		COVID-19	
		Positive (n=76, 21.4%)	Negative (n=278, 78.6%)
Fever (n=226)	Present (226)	63 (27.9)	163 (72.1)
	Absent (128)	13 (10.1)	115 (89.8)
Cough (n=164)	Present (164)	43 (26.2)	121 (73.8)
	Absent (190)	33 (17.4)	157 (82.6)
Breathlessness (n=26)	Present (26)	7 (26.9)	19 (73.1)
	Absent (328)	69 (21.0)	259 (79.0)
Altered/absent taste sensation (n=46)	Present (46)	9 (19.6)	37 (80.4)
	Absent (308)	67 (21.8)	241 (78.2)
Altered/absent smell (n=10)	Present(10)	7 (70.0)	3 (30.0)
	Absent (354)	69 (20.1)	275 (79.9)

Table-IV

Complete blood count parameters and COVID-19 status among study respondents

Variables	COVID-19		p-value*
	Positive (n=76)	Negative (n=278)	
Hemoglobin (g/dL)	13.7 (12.4-14.7)	13.6 (12.075-14.600)	0.811
White Blood Cell (/mm3)	8275 (7142.5-9592.5)	6785 (5830-8045)	<0.001
Neutrophil (/mm3)	4935 (3922.5-5897.5)	3855 (2965-4840)	<0.001
Lymphocyte (/mm3)	2620 (2082.5-3127.5)	2360 (1870.0-2797.5)	0.027
Neutrophil: Lymphocyte ratio	1.9 (1.45-2.5225)	1.7 (1.245-2.310)	0.018
Eosinophil (/mm3)	180 (90-290)	90 (40-170)	<0.001
Basophil (/mm3)	30 (20-40)	10 (10-20)	<0.001
Monocyte (/mm3)	380 (320-450)	355 (280-445)	0.201
Platelet (×103/mm3)	258.5 (213.5- 317.75)	233 (199-296.25)	0.033

*significance at 5% level, Man-Whitney test

Discussion

This study was conducted at the fever clinic established in the initial days of the COVID-19 pandemic. It was intended to gather a cross-sectional picture of their presentations, COVID-19 positivity and any possible correlation with symptoms, complete blood count parameters and C-reactive protein level. A significant proportion of the respondents were health care workers and first responders. They were more exposed to the virus during the early days of the pandemic due to their occupational responsibilities. This may also reflect their high level of awareness regarding the importance of early detection of COVID-19. In another study conducted in the fever clinic4, only COVID-19-positive patients were included. In that study, the patient population had similar age and BMI distribution, which is comparable to ours. In both studies, fever and cough were the most common symptoms, and diabetes mellitus, hypertension and asthma were the most common comorbidities.

A positive relation was found between having fever, cough or anosmia with a positive RT PCR test for COVID-19. Haematological changes in COVID-19 are mostly nonspecific. Most common among these changes are lymphopenia,

elevated Lactate Dehydrogenase (LDH), and elevated inflammatory markers, including C-reactive protein (CRP).[5-9] These changes are more frequent in the earlier phases of the disease than in later phases.[5] Besides, neutrophilia, eosinopenia, mild thrombocytopenia, and rarely thrombocytosis were also seen.[10-17] It was found that lymphopenia was more common and severe in patients with severe diseases.

Similarly, the elevation of C-reactive protein (CRP) was more common in the later period of the disease and was more marked in cases of severe disease.[5,18-23] Besides, there have been reports of various morphological changes in peripheral blood cells in different phases of the disease. In the early days, pronounced granulocytic reaction with features of dysplasia, immaturity, and apoptotic- degenerative changes, including hypolobation, hypogranulation, hypergranulation, vacuolation, and pseudo-pelger-like morphology, were found.

Morphological changes in platelets also were seen. In the later phase of the disease, features of lymphocyte activation and heterogoeneous lymphocyte morphology, including large atypical lymphocytes, lymphoplasmacytic cells, and increased large granular lymphocytes were noted.[5,24-27] A rare case of leucoerythroblastic blood picture has been reported in COVID-19.[28] These findings have been found in studies carried out among the different population.[29-32] Majority of the patients attending the fever clinic have been clinically stable and presented in the early days of symptoms onset compared to those presenting to the emergency department. As a result, haematological and biochemical changes indicating the severity of the disease were relatively less common among our study participants.

Conclusion

The presence of fever, cough or anosmia, or positive CRP independently correlated with positive COVID-19 RT PCR test among patients attending the fever clinic during the pandemic. Haematological changes in unselected COVID-19 patients are mostly non-specific. Large-scale studies in community settings can be carried out to further analyse the short and long-term effect of COVID-19 on haematological parameters.

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