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Original Article

Clinical and Hematological Characteristics of COVID- 19 at Presentation: Egyptian Multicenter Descriptive Study

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ABSTRACT

Background: Since the Ministry of Health and Population [MOHP] in Egypt had declared the appearance of the first COVID- 19 confirmed case in Egypt on February 14, 2020. Strict measures were taken to control the virus spread, including the identification of some centers for triage and others for quarantine.

The aim of the work: The goal of our research was to determine the clinical and hematological results of COVID-19 confirmed patients at two specialized triage hospitals.

Patients and Methods: This was an observational prospective cohort in which we included all adult patients with laboratory-confirmed COVID-19 by RT-PCR of samples taken by nasopharyngeal swabs attended to two Egyptian hospitals that, assigned by MOHP as a triage center for COVID-19, in the period between 5th April to 27th August 2020. The clinical characteristics and hematological findings at presentation were studied.

Results: This study included 200 consecutive COVID-19 confirmed patients from both hospitals, fever [75%] was the main presenting symptom followed by cough [71%] then dyspnea [20%]. [41%] of the patients had lymphopenia, [5%] had lymphocytosis, [11.5%] had neutrophilia, [2%] had thrombocytopenia, and [30.5%] had anemia.

Conclusion: COVID-19 could be presented typically by pulmonary or atypically by various extrapulmonary manifestations in addition to different hematological laboratory findings.

Keywords: COVID- 19; Triage; Clinical; Hematological; Egyptians.

INTRODUCTION

China had declared a serious pneumonia outbreak in Wuhan, Hubei Province, towards the end of 2019[1, 2], which had soon spread to other parts of the world. The primary virus of this cluster of acute respiratory illness was identified as SARS COV 2, an RNA encapsulated virus from the

Carbonitride family, and the sickness was dubbed the new COVID-19 [3- 6]. The World Health Organization [WHO] declared COVID-19 a pandemic on March 11, 2020 [7]. As of August 12, 2021, COVID had been reported in over 205,704,659 cases throughout the world, with over 4,341,226 people dying. Egypt reported the first COVID-19 certified case on February 14, 2020, and as of August 12, 2021, there have been 284,966 confirmed cases and 16,597 fatalities [8]. The incubation time for COVID-19 is estimated to be 14 days, with a median of 4-5 days from exposure to the onset of symptoms [9-11].

The most frequent symptoms include fever, headache, cough, sore throat, and myalgia. In certain circumstances, however, significant symptoms such as multi-organ failure, acute respiratory distress syndrome, and complicated pneumonia can ensue [12–14]. Bilateral pulmonary parenchymal ground-glass and consolidative pulmonary opacities, sometimes with a rounded morphology and more peripherally distributed in the lung field [15, 16], as well as thickened pleural lines, B lines, or consolidative patterns on lung ultrasound [17], were the most common CT findings. With a normal or lowered total leucocytic count, lymphopenia is the most common laboratory finding in COVID-19 [4,13].

Egypt has developed a strict protocol to deal with this pandemic, as it has assigned specific hospitals for triage and others for quarantine and has set the path of the patient starting from the feeling of symptoms till recovery, such that; the patient when he feels symptoms goes to one of the triage hospitals to be examined if he is suspected to have COVID- 19 [according to case definition], PCR is done; if positive he will be transferred by a well-prepared ambulance to previously assigned quarantine hospital. But if negative another PCR will be done after 48 hours if still negative the COVID- 19 will be excluded and the patient will be managed according to another clinical diagnosis. But if the second PCR is positive, the patient will be transferred to the nearest quarantine hospital where further evaluation and management were done according to the national protocol until complete recovery [16].

THE AIM OF THE WORK

We conducted this study to identify the clinical and hematological findings of COVID-19 confirmed cases at presentation in two specialized hospitals designated by the Ministry of Health and Populations [MOHP] as COVID-19 triage hospitals, because there is a paucity of data on the epidemiological and clinical characteristics of COVID-19 patients in Africa, particularly Egypt.

PATIENTS AND METHODS

Study design and participants:

This cohort research study for COVID-19 was undertaken in two specialized hospitals, one in Aswan [Southern Upper Egypt] and the other in Damietta [Northern Egypt]. This research included all adult patients with laboratory-confirmed COVID-19 by RT-PCR of samples collected from nasopharyngeal and oropharyngeal swabs who visited these institutions between April 5th and August 27th, 2020.

Data collection:

Age, sex, residency, history of contact to COVID- 19 confirmed case, and whether or not the patient was a health care professional were all included in the demographic and epidemiological data. A complete blood count [CBC] and serum biochemical testing for liver and kidney function tests were performed in the hospital laboratories. Chest x-rays, lung ultrasounds, and chest computed tomography [CT] scans were among the radiological tests performed. Two competent radiologists reported the radiological diagnosis. RT-PCR analysis of SARS-CoV2 was done from nasopharyngeal or oropharyngeal swabs.

Definition of COVID-19 Severity:

Adults infected with SARS-CoV-2 were divided into the following groups based on the severity of their illness:

- Asymptomatic or pre-symptomatic Infection: who test positive for SARS-CoV-2 on a virologic test [such as a nucleic acid amplification test or an antigen test] but do not show COVID-19-like symptoms.
- Mild Illness: who exhibit any of the COVID-19 signs and symptoms [fever, cough, sore throat, malaise, headache, muscular pain, nausea, vomiting, diarrhea, loss of taste and smell] but no shortness of breath, dyspnea, or abnormal chest imaging and test positive for SARS-CoV-2 using a virologic test.
- Moderate Illness: who test positive for SARS-CoV-2 by virology test and have a saturation of oxygen [SpO_2] of 94% on room air and show signs of lower respiratory tract disease during

clinical examination or imaging.

- Severe Illness: who test positive for COVID-19 using a virologic test and have a SpO_2 of less than 94%, respiratory rate more than 30 breaths/min, or lung infiltrates of > 50%.
- Critical illness: who had criteria of severe illness with respiratory failure, septic shock, and/or multiple organ dysfunction [16].

Statistical analysis: The information was collected, coded, evaluated, and entered into IBM SPSS version 22. [Statistical Package for Social Science]. Quantitative data with parametric distributions were presented as mean, standard deviations, and ranges, whereas quantitative data with non-parametric distributions were presented as median with interquartile range [IQR]. When comparing two groups with qualitative data, the Chi-square test was employed, but when the projected count in any cell was less than 5, the Fisher exact test was used instead. The independent t-test was used to compare two groups with quantitative data and parametric distribution, whereas the Mann-Whitney test was used to compare two groups with quantitative data and non-parametric distribution. As a result, the p-value below 0.05 was significant.

RESULTS

In this study, 200 patients were included, with 132 [66%] of them being males. The patients investigated varied in their age from 18 to 69 years old, with a mean age of [40.4 ± 11.3] years. The age of 192 patients [96% of total patients] were under age of 60 years with mean age of [39.4±10.5], and 4% of total patients were over age of 60 years with mean age of [64.1±3.3]. In terms of the probable source of infection, 15 patients [7.5%] of them were healthcare workers, 59 [29.5%] had a history of home contact with confirmed COVID-19 cases, and 126 [63%] had no clear contact history. A total of 174 patients [87%] had no associated comorbidities; while 20 patients [10%] had associated single comorbidity distributed as follow; 10 patients [5%] had diabetes mellitus [DM], 9 patients [4.5%] had hypertension [HTN] and a single male patient [0.5%] had cancer esophagus. out of 6 patients [3%] had more than one comorbidity; Chronic obstructive pulmonary disease [COPD] and DM were reported in one patient [0.5%], COPD and HTN were found in another patient [0.5%], ischemic heart disease [IHD] and HTN in 2 patients [1.0%], finally DM and HTN occurred in 2 patients [1.0%]. In our patients; there was a single pregnant female.

Regarding the clinical presentation, fever was the main presenting symptom followed by cough then dyspnea. Some patients presented with gastro-intestinal, cardiovascular, or neurological clinical manifestations as shown in table [1].

Regarding the hematological finding of the studied patients, there were 61 patients [30.5%] anemic, 5 patients [2.5%] had thrombocytosis while 4 patients [2%] showed thrombocytopenia, 25 patients [12.5%] had leukopenia and 21 patients [10.5%] had leukocytosis. The median value of Neutrophil to lymphocytes ratio [NLR] was calculated as 3 with a range of 0.45-23.2. Elevated ALT and AST were found in 19 [9.5%] and 29 [14.5%] patients respectively, but there were no changes in serum creatinine level in all studied patients as shown table 2. Computed tomography of the chest revealed normal in 42 patients [21%], while compatible radiological features of COVID-19 were shown in 158 patients [79%], 150 patients [75%] of them had bilateral peripheral ground-glass opacity [GGO] and unilateral patches of [GGO] were reported in 18 patients [9%]. By comparing laboratory and CT findings of the studied patients regarding gender or age there was no statistically significant difference observed in WBC, platelets count, lymphocytes, PNL percentage, liver enzymes [ALT and AST], serum creatinine levels, or Chest imaging between male and female patients. However, hemoglobin level was much lower in female patients as shown in tables 3 and 4.

Table [1]: The main clinical characteristics of the studied COVID-19 Patients:

Symptoms	n [%]
Fever	150 [75.0%]
Cough	143 [71.5%]
Dyspnea	40 [20.0%]
Sore throat	25 [12.5%]
Diarrhea	13 [6.5%]
Vomiting	4 [2.0%]
Anosmia	12 [6.0%]
Palpitation	3 [1.5%]
Coated tongue	2 [1%]
Chest pain	1 [0.05]

Table [2]: Baseline Hematologic and other Biochemical markers of the studied COVID-19 Patients

	Variable	n [%]	Mean ±SD	Range [median]
HB [g/L]	**Normal** **Anemia**	139[69.5%] 61[30.5%]	13.3±1.5	8.0 – 17.0 [13.0]
Platelet [×10^3] /cmm	Normal Thrombocytosis Thrombocytopenia	191[95.5%] 5 [2.5%] 4 [2.0%]	161.4±78.8	101.0 – 584.0 [242.0]
WBCs [×10^3] /cmm	Normal Leucopenia Leukocytosis	154[77.0%] 25 [12.5%] 21 [10.5%]	7.5±3.1	2.0 – 20.0 [7.0]
Lymphocytes [%]	< 20% > 40%	83 [41.5%] 10 [5%]	24.2%±10%	4.0 – 62.0% [20.1%]
\PNL [%]	< 40 % 40.0 – 75.0 > 75%	28 [14%] 125[62.5%] 47 [23.5%]	64.3%±15.3%	14.0% - 94.0% [66.0%]
NLR		200 [100%]	3.5±2.9	0.45 – 23.2 [3.0]
ALT[IU/L]	Normal Elevated ALT	181[90.5%] 19 [9.5%]	27.1±15.0	10.0 – 143.0 [24.0]
AST[IU/L]	Normal Elevated	171[85.5%] 29 [14.5%]	24.7±10.1	10.0 – 75.0 [21.0]

Table [3]: Comparison between the studied COVID-19 patients regarding to gender and CT findings

Variable		Gender		P-value
		Male 132[66%]	Female 68[34%]	
HB [g/L]		14.02±1.1	11.9±1.1	***0.001[S]***
Platelet [×10^3] /cmm		257.3±75.0	251.2±76.6	0.595[NS]
WBCs [×10^3] /cmm		7.9±3.2	7.04±2.6	0.141[NS]
Lymphocytes percentage		23.0±10.8	23.6±8.5	0.232[NS]
PNL percentage		65.0±15.9	63.2±14.5	0.349[NS]
ALT [IU/L]		26.8±17.5	24.4±11.8	0.814[NS]
AST [IU/L]		23.6±17.6	22.5±11.8	0.624[NS]
CT imaging finding:	Normal Compatible	33 [25%] 99 [75%]	9 [13.2%] 59[86.8%]	

Table [4]: comparison between the studied COVID-19 Patients regarding to age and impact of age on laboratory and CT findings

Variable	Age		P-value
	Mean ±SD		
	<60 years 192[96%]	≥ 60 years 8[4%]	
HB [g/L]	13.2±1.4	13.0±2.0	0.637 [NS]
Platelet [×10^3] /cmm	256.3±76.3	228.5±53.7	0.311[NS]
WBCs [×10^3] /cmm	7.5±2.9	9.1±5.0	0.153[NS]
Lymphocytes percentage	23.5±10.0	18.9±8.9	0.217[NS]
PNL percentage	64.4±14.8	60.9±24.8	0.524[NS]
ALT [IU/L]	26.1±15.9	21.0±5.6	0.363[NS]
AST [IU/L]	23.3±9.5	19.8±7.2	0.324[NS]
CT imaging findings:	N [%]		0.319[NS]
-Normal	42 [21.9%]	0 [0.0%]	
-Compatible	150 [79.1%]	8 [100.0%]	

DISCUSSION

Many specialized institutions for the isolation and treatment of COVID-19 have been constructed after the detection of the first African case of COVID-19 in Egypt in mid-February 2020. As a result, data on COVID-19 epidemiological and clinical characteristics in Egypt has been investigated. In Egypt, the Aswan specialized hospital and the Damietta fever and chest hospitals covered a broad geographic region. The goal of this study was to characterize the clinical and hemato-logical results of 200 COVID-19 confirmed cases in these two specialized hospitals in Egypt at the time of presentation.

In our study, males constituted the main percentage of cases. This finding is in agreement with some reported studies in other countries [9, 18].

The same finding was reported also in another Egyptian study [19].

Women were less likely to be infected than men may be due to increased risk of contact exposure in men., secondly, may be due to more robust innate and adaptive immune responses of women [20].

Women are more likely to adhere to proper hand hygiene and follow preventive measures than men [21].

Most of the included patients were younger than 60 years. All the age groups might have been infected with COVID-19. Person-to-person transmission through respiratory droplets from coughing, sneezing or talking and close contact was initially proposed as the main routes of transmission of SARS-CoV2 based on experiences gained in SARS-CoV and MERS [22].

Nearly, one-third of our cases had a history of close contact with confirmed COVID-19 patients either throughout the work shift or at home. These findings were consistent with SARS-CoV2 transmission from individual to individual in hospital and family settings [23].

Approximately two-thirds of patients, on the other hand, had no apparent epidemiological history of contact. This might be owing to the likelihood of infection transmission from an asymptomatic patient with a non-specific and transient sickness during the incubation period, or it could be due to presence of a healthy carrier [24].

During the initial wave of the Covid-19 epidemic, illness diagnosis was linked to a wide range of symptoms, radiological findings, and disease severity, as well as higher fatality rates [25].

The majority of COVID-19 patients exhibited fever as well as respiratory symptoms as cough and dyspnea, according to reports. Fever was the most common presenting symptom in this research, followed by cough. These findings were in line with earlier research findings [19,21,24].

COVID-19 can cause a variety of extra-pulmonary symptoms by binding to angiotensin-converting enzyme 2 [ACE2] receptors in many organs [26].

In our study, diarrhea was the most common gastrointestinal symptom. Others concluded that digestive issues, particularly diarrhea, are prevalent in COVID-19 patients [27].

COVID-19 can cause anosmia in up to 5% of instances [28-29], according to some published descriptive studies, this was comparable to our findings, which showed that anosmia was prevalent in 6% of patients. SARS-CoV-2 might reach the central nervous system through the nasal mucosa, where nasal mucosa epithelial cells showed the greatest expression of the virus.

Also, few enrolled cases reported cardio-vascular symptoms; SARS-CoV-2 can result in direct & indirect cardiovascular sequelae [30-34].

Two of the patients in our research had coated tongues, one of which was dry.

This was in line with the findings of Diaz Rodriguez *et al*. [35] and Iranmanesh *et al*. [36], who found that older patients with a higher degree of COVID-19 illness may have severe oral lesions.

Stress, poor oral hygiene, immunosuppression, vasculitis, opportunistic infections, and a hyper-inflammatory response related to COVID-19 were the most important predisposing factors for the development of oral lesions in those patients [35,36].

COVID-19 patients may show many laboratory abnormalities; in our study, about one-third of patients were anemic and this was consistent with Huang *et al*. [4], who concluded reduction in hemoglobin levels in 38.2% of hospitalized patients for COVID-19.

As expected, few patients had thrombo-cytopenia or leucopenia whereas more than one-third of the patients had lymphopenia. Early in the disease course, leukocytes are normal or slightly reduced [37]. Lymphopenia was detected in almost 40% of COVID-19 patients [38].

There was also a link between lymphopenia and the requirement for ICU care [37-38] or the development of acute respiratory distress syndrome [ARDS] [39-41].

As a result, serial analysis of lymphocyte percentage dynamics may be useful in predicting COVID-19 patient outcomes. Surprisingly, only a few individuals had lymphocytosis, which was uncommon in SARS-Cov2 patients' peripheral blood films [41—44].

Also, some patients had neutrophilia, Zhang *et al* reported that neutrophil percentage increased by approximately 40% in the peripheral blood of patients with SARS COV [45].

Neutrophils are the principal source of cytokines and chemokines. The formation of cytokine storms can result in ARDS and death in SARS-COV and MERS [46-47].

The median value of NLR was nearly similar to that calculated in the derivation cohort by Liu *et al*., the NLR had promising value in risk stratification of patients with COVID-19

pneumonia which allows easy patient classification and management [48].

Elevated ALT and AST levels were reported in some of the patients. Typically, serum amino-transferases are elevated in COVID-19 but didn't exceed five times the upper limit of normal [19, 49].

Well understanding of the natural course and dynamics of COVID-19 is still needed. CT imaging of the chest was normal in < 30% of confirmed cases. SARS-CoV-2 infection was confirmed before the occurrence of radiological findings of viral pneumonia [18].

Conclusion:

COVID-19 is a novel disease caused by an emerging SARS-CoV-2. In adult Egyptian patients, it was presented mainly by respiratory manifestations and had a wide range of biochemical abnormalities in blood counts and liver function tests.

List of Abbreviations:

DM: diabetes mellitus.

HTN: hypertension.

COPD: Chronic obstructive pulmonary disease.

IHD: Ischemic heart disease.

Hb: Hemoglobin.

WBC: White blood cells.

PNL: Polymorphonuclear lymphocytes.

NLR: Neutrophil-lymphocyte ratio.

AST: Aspartate aminotransferase

ALT: Alanine aminotransferase.

Ethics approval and consent to participate:

The protocol of the study was approved by scientific Committee for Management of COVID-19, Ministry of Health and Population [MHP] according to the Declaration of Helsinki. Ethics reference number: IRB 00012367-20-03-007

Consent for publication: was taken from all participants

Availability of data and materials:

The data that support the findings of this study are available from [the scientific committee of COVID-19, Ministry of health and population, Egypt] but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of [the scientific committee of COVID-19, Ministry of health and population, Egypt].

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