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Coronavirus Pandemic

Clinical features and laboratory characteristics of patients hospitalized with COVID-19: single centre report from Egypt

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Abstract

Introduction: The recently discovered novel coronavirus disease (COVID-19) has emerged in Wuhan, China, since January 2020. Egypt reported a low incidence of infection when compared with other countries. The aim of the study was to assess the characterization of COVID-19 infection among the Egyptian population.

Methodology: Data were collected from a single COVID-19 quarantine hospital in Cairo. A total number of 195 cases were included with their clinical, laboratory, and radiological data.

Results: Three different age groups behaved differently for COVD-19 infection. The pediatric age group was asymptomatic entirely, the middle age group (18-50 years) were asymptomatic in 53.3% of cases, while 77.9% of those above 50 years were symptomatic ($p \leq 0.001$). The latter group had a high incidence of COVID-pneumonia in (83.1%), and moderate to critical presentations were encountered in 66.3% of them. Neutrophil to lymphocyte (N/L) ratio correlated directly with the age and case severity. C-reactive protein (CRP) and computed tomography scan chest (CT-chest) had added value on COVID-19 diagnosis in suspected cases.

Conclusions: In Egypt, patients above 50 years are at a higher risk for symptomatic COVID-19 infection and leaner for moderate to critical COVID-19 presentation. The triad of CT-chest, CRP, and N/L ratio could be an integrated panel for assessing disease severity.

Key words: Egypt; COVID-19; SARS-CoV-2; coronavirus; age group; clinical presentation.

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Introduction

The end of 2019 was marked by the emergence of a novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which was initially reported in Wuhan, China [1]. Since the outbreak of the novel coronavirus disease (COVID-19) in December 2019, there has been an escalation in numbers of reported confirmed cases worldwide to exceed 20 million, with more than 700,000 deaths, according to World Health Organization (WHO), as of August 1, 2020 [2]. The animal-human interface could represent the primary source of the disease with a possible initial zoonotic emergence [3].

It had been reported that the basic reproduction (R0) to the human-to-human transmission was around 3.58 while it was 2.30 for the bat-to-human transmission [4]. Other researchers reported that the median daily R(t) of SARS-CoV-2 ranged between 1.6 - 2.6 [5]. The disease incubation period has been reported to be about five days, although some reports claimed that it might be as long as 14 days [1,6]. The asymptomatic carriers play an essential role in the virus spread [7]. Moreover, infected persons can shed the virus early during infection [8,9].

Clinically, the spectrum of SARS-CoV-2 infection is vast, ranging from asymptomatic infection or mild respiratory tract illness to severe pneumonia with respiratory failure and death. The clinical manifestations are usually nonspecific, and the most common are fever and dry cough in the majority of

patients, while 30% of patients report shortness of breath. Other symptoms include myalgia, headache, sore throat, and diarrhea [10,11]. An international multicenter study reported that 14% of the infected patients develop a severe disease that requires hospitalization and oxygen support, and 5% require admission to an intensive care unit. In severe cases, COVID-19 can be complicated by acute respiratory distress syndrome (ARDS), sepsis and septic shock, multiorgan failure, including acute kidney injury, myocarditis, stroke and thromboembolic events [12]. Older patients and those with comorbidities, such as cardiovascular disease, diabetes mellitus, obesity, and cancer patients have an increased risk of severe disease and mortality [13]. COVID-19 case fatalities showed some discrepancies across countries [14]. Detecting viral particles using real-time reverse-transcription polymerase chain reaction (RT-PCR) is the gold standard of diagnosis and monitoring [15,16]. 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, myoglobin, D-dimer, lactate dehydrogenase (LDH) and numerous other laboratory parameters have been described to change with COVID-19 infection [17,18].

Egypt was considered at an earlier stage of the current epidemic to have the highest risk of SARS-CoV-2 infection importation among African countries [19]. On February 14, 2020, Egypt announced the diagnosis of the first case of COVID-19 in Africa. After that, the number of daily reported cases continued to rise until reaching nearly 95,000 cases by Aug 1 [2]. In response to this pandemic, Egypt abandoned individual hospitals in every governorate to be assigned as quarantine hospitals for isolating COVID-19 patients. Additionally, Egyptian MOH issued a standardized guide for the diagnosis and management of COVID-19, where cases are classified on clinical bases into mild, moderate, severe, and critical [20,21].

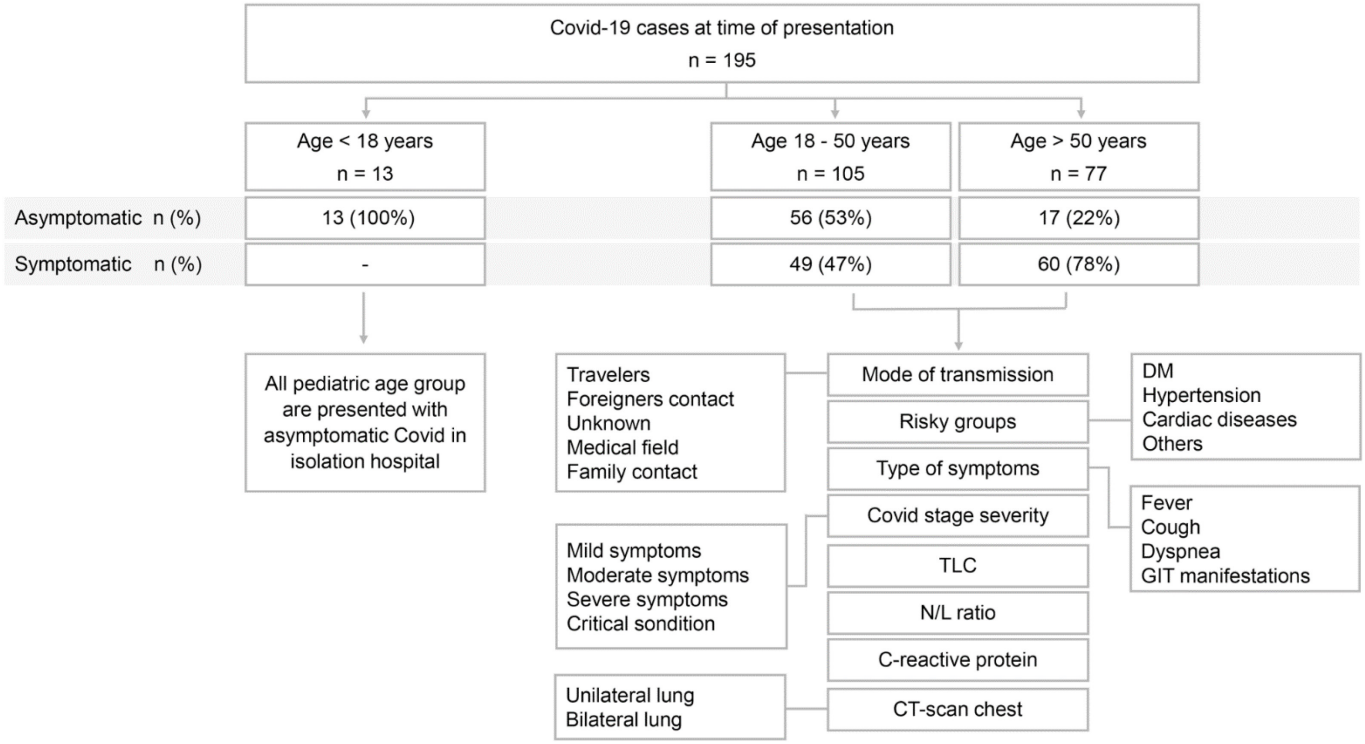
The current study aimed at describing the epidemiological, clinical, and radiological characteristics of admitted patients with COVID-19 among the Egyptian population.

Methodology

This study was piloted in a single-center devoted to the isolation and management of COVID-19 patients. Inclusion criteria were any suspected COVID-19 cases with one of the following virological or serological evidence of diagnosis:

- Positive RT-PCR for novel SARS-CoV-2 RNA
- Positive serum Viral specific IgM and IgG against COVID-19
- Viral specific IgG veering from negative to positive [22]

Figure 1. Different age groups of COVID-19 cases at time of presentation in single Egyptian isolation hospital.



During April and early May, the data of 195 COVID-19 cases were collected after confirmed positive results of nasopharyngeal and/or oropharyngeal RT-PCR swabs for SARS-CoV-2 RNA. As shown in Figure 1, confirmed cases were classified according to their age into; pediatric age group (< 18 years of age), young adult age group (18- 50 years of age), and above 50 years age group (> 50 years of age). Further subgroups were analyzed for the symptomatic presentation of COVID-19 cases. The pediatric age group was completely asymptomatic, while the young adult age group was compared with the above 50 years of age group in respect to multiple factors such as; the suspected mode of transmission, risk factors and comorbidities, types of presenting symptoms, degree of clinical case severity, and baseline lab results. The labs included mainly; TLC, lymphocytic count and neutrophil/lymphocytic ratio, and serum CRP. Also, baseline screening non-contrast CT-scan chest was performed in all cases.

Patients admitted to the isolation hospital were classified according to their grade of disease severity into five different stages defined as follows: Asymptomatic cases; in the absence of any clinical symptoms. Mild cases; which were considered when clinical symptoms are trivial without clinical or radiological manifestations of pneumonia. Both mild and asymptomatic cases were admitted to quarantine hospitals to reduce the incidence of viral transmission and dissemination. Moderate Cases; when patients have symptoms such as fever in association with manifestations of respiratory tract symptoms, and pneumonia was confirmed with CT-chest. Severe Cases; defined by any of the following criteria: Respiratory rate > 30 breaths/min; Oxygen saturation < 93%; Arterial partial pressure of oxygen (PaO_2)/ Fraction of inspired oxygen (FiO_2) < 300 mmHg or more than 50% progression in the chest radiological findings within 24 to 48 hours. Critical cases; defined by any of the following criteria: respiratory failure that required mechanical ventilation, the manifestation of shock, and/or other organ failures that require monitoring and treatment in the ICU [20,23,24].

Statistical analysis

Data were analyzed using the SPSS v24.0 software program for windows. Categorical variables were compared using Pearson Chi-square, and significance was considered when the P-value was < 0.05, and a highly significant result considered when the p-value was < 0.01. When the p-value was significant, residual estimate value should be revised to highlight cells with significance and whether it has a positive or negative correlation. Whereas continuous variables were analyzed using independent samples T-test and one-way ANOVA to compare means.

Ethical Considerations

All procedures performed in this study were in accordance with the national research committee's ethical standards and the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The study was approved by the Research Ethics Committee (REC) of the Central Directorate of Research and Health Development and Reviews at the Egyptian Ministry of Health and Population (Serial: 12-2020/4).

Results

COVID-19 had shown different aspects of clinical presentations according to the category of age groups. Table 1 summaries the significant differences in each age group; the pediatric age group (n = 13) had a mean age of 11.4 years, young adults (n = 105) had a mean age of 35.7 years, and above 50 years of age group (n = 77) had a mean age of 61.3 years. During the early phase of the COVID-19 presentation, we were able to understand the characteristics of asymptomatic cases. The COVID-19 cases were distributed according to their age into; pediatric group 13 (6%), young adults 105 (53.8%), and above 50 years group 77 (39.4%).

Asymptomatic cases were presented in 86/195 (44%) as follows; (100%) of pediatric cases, (53.3%) of the young adult cases, and (22.2%) of the above 50 years cases. While symptomatic cases were presented in 109/195 (56%), most of them were represented in the above 50 years cases (77.7%). The symptomatic status of the COVID-19 presentation was significantly in a direct correlation with age ($p < 0.001$).

The severity of clinical presentation was classified into mild, moderate, severe, and critical stages with different distribution according to the age group. Young adults had a highly significant mild clinical presentation in 14/105 (13.3%). Meanwhile, the above 50 years cases had a double risk of the young adults to have advanced stages of clinical presentations as follows; [in moderate cases 32/77 (41.6%), severe cases 11/77 (14.3%), and critical cases 8/77 (10.4%) ($p < 0.001$)].

The initial COVID-19 questionnaire revealed that the suspected mode of transmission would significantly differ within each age group ($p < 0.001$). As in the pediatric cases, the majority had a history of positive COVID-19 family contacts in 8/13 (61.5%). Young adults had a significant history of contact with

foreigners in 10/105 (9.5%) or were working in medical fields in 22/105 (21%) while above 50 years cases had a significant history with recent traveling in 14/77 (18.2%) or had an unknown source of infection in 44/77 (57.1%).

Risk factors such as diabetes, hypertension, or cardiac diseases were more evident among the above 50 years age group in 34/77 (44.2%), 33/77 (43%), and 14/77 (18%), respectively; ($p < 0.001$).

Symptoms of COVID-19 at the time of diagnosis were in the form of; fever, cough, and/or dyspnea. They were significantly presented in the above 50 years age group [36/77 (46.7%), 47/77 (61%), and 18/77 (23.4%), respectively. The above 50 years of age group also had higher rates of presenting symptoms (such as fever, cough and/or dyspnea) than in younger age groups. GIT manifestations of COVID-19 were presented in a minority of patients 6/105 (5.7%) in adults age group,

Table 1. Baseline demography of COVID cases according to the different age groups.

	Age < 18 years	**Age 18 - 50 years**	**Age > 50 years**	
n = 195	**n (%)**	**n (%)**	**n (%)**	**p-value**
Age group n (%)	13 (6.6)	105 (53.8)	77 (39.4)	0.97
mean (±SD)	11.4 (± 4.7)	35.7 (± 8.3)	61.3 (± 6.9)	
Gender				0.97
Male	8 (61.6)	63 (60)	47 (61)	
Female	5 (38.4)	42 (40)	30 (39)	
Comorbidities				
Diabetics	-	12 (11.4)	34 (44.2)	**< 0.001**
Hypertension	-	8 (7.8)	33 (43)	**< 0.001**
Cardiac diseases	-	-	14 (18)	**< 0.001**
Others*	-	4 (3.8)	8 (10.4)	0.14
Mode of transmission				**< 0.001**
Recent travelling	-	7 (6.7)	**14 (18.2)**	
Contact with foreigners	-	**10 (9.5)**	4 (5.2)	
Unknown mode	5 (38.5)	55 (52.3)	**44 (57.1)**	
Medical field contact	-	**22 (21)**	6 (7.8)	
Via Family member	**8 (61.5)**	11 (10.5)	9 (11.7)	
Symptomatic cases				**< 0.001**
No	**13 (100)**	**56 (53.3)**	17 (22.1)	
Yes	-	49 (46.7)	**60 (77.9)**	
Clinical presentation				
Fever	-	26 (24.7)	**36 (46.7)**	**< 0.001**
Cough	-	35 (33.3)	**47 (61)**	**< 0.001**
Dyspnea	-	13 (12.3)	**18 (23.4)**	**0.029**
GIT symptoms	-	6 (5.7)	9 (11.7)	0.2
Clinical stage severity**				**< 0.001**
Asymptomatic	**13 (100)**	**56 (53.3)**	17 (22.1)	
Mild	-	**14 (13.3)**	9 (11.7)	
Moderate	-	23 (21.9)	**32 (41.6)**	
Severe	-	9 (8.6)	**11 (14.3)**	
Critical	-	3 (2.9)	**8 (10.4)**	
CT-Chest positive criteria				**< 0.001**
No	**13 (100)**	**63 (60)**	13 (16.9)	
Yes	-	45 (40)	**64 (83.1)**	
CT-scan – affected side				0.55
Unilateral	-	17 (16.2)	16 (20.8)	
Bilateral	-	88 (83.8)	61 (79.2)	
CRP elevated				**< 0.001**
No	13 (100)	**77 (73.3)**	19 (24.7)	
Yes	-	28 (26.7)	**58 (75.3)**	
Laboratory mean (±SD)				0.15
HB	11.4 (± 1.5)	13.1 (± 1.6)	12.5 (± 1.1)	
TLC	8.2 (± 3.5)	5.4 (± 2.2)	6.9 (± 3.8)	0.28
Lymphocytes	2.3 (± 0.8)	1.9 (± 0.7)	1.8 (± 2.1)	**0.01**
N/L ratio	1.4 (± 0.6)	1.8 (± 0.9)	3.7 (± 2.8)	**0.008**
Platelets	295 (± 61)	223 (± 77)	241 (± 95)	0.90
Urea	25 (± 9)	30 (± 10.4)	46 (± 47)	0.15
Creatinine	0.6 (± 0.3)	0.9 (± 0.3)	1.2 (± 1.1)	0.50
AST	36 (± 51)	32 (± 40)	33 (± 19)	0.61
ALT	31 (± 40)	36 (± 60)	29 (± 18)	0.50

* other diseases or medical condition such as; Hypothyroidism, previous cerebrovascular strokes, pregnancy, epilepsy, chronic renal disease, depression, end stage renal disease, lymphoma, parkinsonism. ** Severity of COVID-19 clinical stage at the time of presentation. NB: Percentage was calculated in each column that count up into (100%).

and in 9/77 (11.7%) in the above 50 years age group (p = 0.2).

Every patient with positive COVID-19 RT-PCR had a screening CT-scan chest without contrast, even if asymptomatic cases. The results were highly significant with positive criteria for COVID-19 in 64/77(83.1%) of the above 50 years age group (p < 0.001) compared to 45/105 (40%) in the younger age group while all the pediatric cases had negative imaging criteria for COVID-19 pneumonia.

Baseline laboratory panel was withdrawn at the time of admission included: CBC, kidney functions, liver functions, and CRP. The N/L ratio showed significant mean values compared with the different age groups, which means that N/L ratio increases with age in COVID-19 cases. Also, the mean lymphocytic count at baseline was significantly decreased in the above 50 years age group compared to younger cases (p = 0.01). CRP was elevated in 58/77 (75.3%) of the above 50 years age group, compared to 28/105 (26.7%) in the young adult age group. None of the pediatric cases had elevated CRP at baseline.

From the previous results, it was clear that the pediatric age group acted as asymptomatic COVID-19 carriers with negative imaging and lab results compared to other age groups. The comparative analysis was conducted between asymptomatic and symptomatic COVID-19 cases, and this comparison was among young adults against the above 50 years age group while the pediatric cases had been excluded. Table 2 illustrates this comparative analysis regarding the significant positive parameters at the baseline demography. Positive CT-chest criteria of pneumonia confirmed the diagnosis of lower respiratory tract COVID-19 infection (LRTI), while negative imaging criteria in symptomatic COVID-19 patient designates with upper respiratory tract COVID-19 infection (URTI).

In asymptomatic patients, the incidence of the upper respiratory tract (URTI) COVID-19 infection was almost similar in both young and above 50 years age groups, 50/56 (89.4%), and 13/17 (76.5%) respectively (p = 0.41). Moreover, asymptomatic LRTI pneumonia was confirmed radiologically in 6/56 (10.6%) of young adults versus 4/17 (23.5%) of the above 50 years cases (p = 0.41). On the other hand, (LRTI) COVID-19 pneumonia was instead detected in 56/60 (93.3%) of the above 50 years cases compared to 34/49 (69.4%) in younger cases (P < 0.001).

Elevated serum CRP levels were seen more associated with symptomatic COVID-19 patients. Furthermore, it was highly presented among above 50 years cases 50/60 (83.3%) compared to young cases, 22/49 (45%) (p = 0.006). The mean value of (N/L) ratio was significantly higher in symptomatic COVID-19 patients, and it was also higher in above 50 years patients 3.9 (± 2.8) than in young adults 2.2 (± 1.0), (p = 0.02).

Table 3 summaries the mean values of the laboratory results compared to different COVID-19 stages of severity. COVID-19 severity was directly correlated to the age group, and N/L ratio was pathognomonic to COVID-19 infection and correlates directly with case severity. Critical COVID-19 cases had significant uremia and renal impairment with p-values of < 0.001 and 0.001, respectively.

Discussion

Egypt has a low incidence of COVID-19 virus infection compared to western Europe and the United

Table 2. Clinical presentation of asymptomatic versus symptomatic COVID-19 cases in the young age group (18 – 50 years) in comparison to elder age group (> 50 years) at the time of presentation.

			Asymptomatic covid-19 cases n = 73			Symptomatic covid-19 cases n = 109		
			Age 18-50 years n = 56	Age > 50 years n = 17	P-value	Age 18-50 years n = 49	Age > 50 years n = 60	p-value
		mean age (±SD)	32.9 (±8.1)	58.6 (±5.1)		38.9 (±7.6)	62.1 (±7.1)	
CT-chest	Free imaging	Upper respiratory tract infection	50 (89.4%)	13 (76.5%)	0.41	**15 (30.6%)**	7 (6.7%)	**0.001**
	(positive) criteria	Lower respiratory tract infection	6 (10.6%)	4 (23.5%)		34 (69.4%)	**56 (93.3%)**	
	Affected lung	Unilateral	-	-	-	12 (18.8%)	5 (22%)	0.72
		Bilateral	6 (100%)	4 (100%)		40 (81.2%)	25 (78%)	
CRP		Normal	50 (89.5%)	17 (100%)	0.55	**27 (55%)**	10 (16.7%)	**0.006**
		Elevated	6 (10.5%)	-		22 (45%)	**50 (83.3%)**	
Lymphocytes		Mean (±SD)	2.2 (±0.7)	1.6 (±0.5)	0.10	1.6 (±0.7)	1.9 (±2.3)	0.43
N/L ratio		Mean (±SD)	1.5 (±0.7)	1.8 (±0.1)	0.17	2.2 (±1.0)	3.9 (±2.8)	**0.02**

NB: The pediatric age group (n = 13) was excluded from this comparison. The total number of asymptomatic COVID cases were 86 (44%) = [13 (6.6%) pediatric cases and 73 (37.4%) adult cases], while symptomatic COVID cases were 109 (56%).

Table 3. Comparison between the mean values of baseline labs in each stage of COVID infection.

n = 195 (%)	Asymptomatic n = 86 (44%) mean (±SD)	Mild n = 23 (12%) mean (±SD)	Moderate n = 55 (28%) mean (±SD)	Severe n = 20 (10%) mean (±SD)	Critical n = 11 (6%) mean (±SD)	p-value
Age	34.7 (±15.8)	46 (±11.3)	51 (±13.5)	54 (±15.4)	58 (±13.3)	< 0.001
TLC	5.7 (±2.4)	6.7 (±3.7)	5.3 (±2.0)	7.0 (±3.1)	10.4 (±6.8)	0.001
Lymphocytes	2.1 (±0.7)	2.8 (±3.2)	1.5 (±0.7)	1.2 (±0.3)	0.9 (±0.7)	0.03
N/L ratio	1.5 (±0.7)	1.8 (±0.8)	3.1(±2.1)	4.2 (±1.8)	12.5 (±1.1)	< 0.001
Urea	28.8 (±10)	33 (±8.7)	28 (±6.9)	39 (±11)	94 (±82)	< 0.001
Creatinine	0.9 (±0.3)	0.9 (±0.2)	0.9 (±0.2)	1.1 (±0.2)	2.1 (±2.4)	0.001

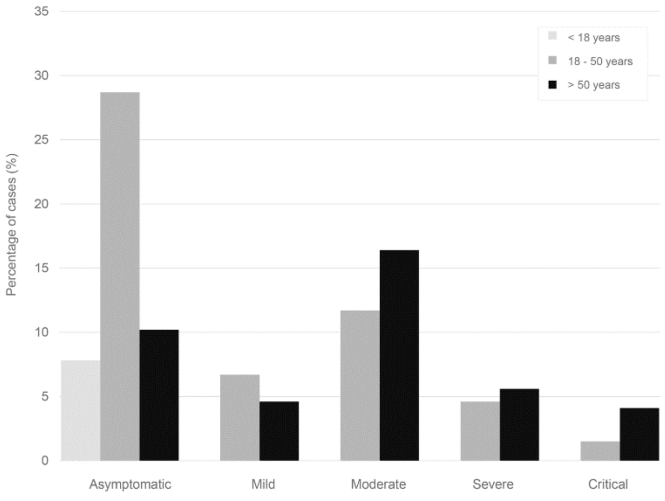
States [20,25]. Since discovering the first case of the SARS-CoV-2 case in Egypt, the authorities took some interventions to prevent further infections. All tourists coming to Egypt were examined and to be traced for the development of any suggestive symptoms. After that, the government decided to take stricter arrangements, where all schools and universities were suspended, with a shift to electronic distance learning. Also, Egypt imposed a curfew from 7 pm until 6 am, starting from April to the beginning of August 2020. All sports and many social activities were also disqualified during this period to avoid the disease spread [20,21]. The complete lockdown policy was not adopted despite its success in other countries with similar situations [26]. The Egyptian ministry of health confronted the problem in a way to raise the threshold of health care services to cope with this novel pandemic [20,21,25]. They postulated 30 first-line isolation hospitals all over the country, which were devoted to COVID-19 cases [20,25]. Estimating the magnitude and characteristics of the COVID-19 pandemic is critical for disease management and care arrangements, especially for critically ill patients, in addition to the organization of outbreak response and provision of health care system [27]. Data in the current study were collected from a single COVID-19 quarantine hospital in Cairo. During the time of (April - Early May), any confirmed COVID-19 case was referred to an isolation hospital, whether it has a symptomatic or asymptomatic presentation. During this early phase of COVID-19 in Egypt, we have a prospect to isolate positive contacts (asymptomatic carriers) and symptomatic cases in the devoted isolation hospitals to prevent viral spread. Moreover, It was clear from the results that the pattern of clinical presentation differs inconsistent with each age group [28].

The pediatric age group in the current study was asymptomatic in 100% of the cases, which is different from other studies [29]. However, there is an assumption that the Bacillus Calmette–Guérin (BCG) vaccine might reduce the clinical presentation of COVID-19 infection in the pediatric age group [20,30] as BCG is an obligatory vaccine in Egypt, including and its booster doses among young children [31,32]. The same results were encountered in a small study coming from upper Egypt, including 36 patients with mild/moderate COVID-19 infection and 30 patients with severe/critical conditions. The authors reported a significantly older age among severe (62.6 years old ± 10.1SD) than mild/moderate cases (55.5 ± 10.1) ($p < 0.05$) [33].

The early phase of COVID-19 cases could express the source of acquiring the viral infection into the country according to each age group. As pediatric cases got infected through contacts within family members, and young adults were in contact with foreigners, either working in (touristic sites) or in medical fields (as health care workers) [34,35]. While above 50 years cases had a history of recent traveling abroad or via unknown sources of infection, the past medical history (especially diabetes and hypertension) might play a significant role in case of severity in symptomatic above 50 years COVID-19 cases; this fact is similar to several previous published data [11,13,23,28].

Age group (>50 years) was more symptomatic, leaner for LRTI COVID-19 pneumonia, and at higher

Figure 2. Bar chart showing the different stages of COVID severity within each age group.



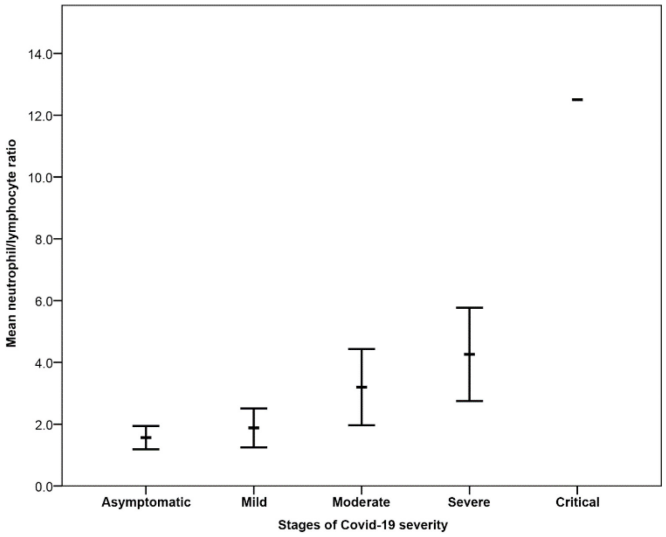
risk for moderate to severe COVID-19 presentation. Figure 2 shows a significant correlation between each COVID-19 stage with each age group. It summarized the positive correlation with the above 50 years age group; meanwhile, it was negatively correlated with pediatric or younger adults.

Symptomatic patients had more fever and cough at the time of presentation as the main significant clinical symptoms [28]. Dyspnea was associated with (LRTI) COVID-19 pneumonia [29]. GIT manifestations associated with COVID-19 infection were limited to a few cases but should be deliberated during the era of the COVID-19 pandemic [36]. A CT-scan chest is a compassionate tool for screening even among asymptomatic cases, and also could be able to discriminate between URTI and LRTI COVID-19 infections [37]. CRP elevation in suspected symptomatic COVID-19 cases would be significantly associated with the above 50 years age group with LRTI COVID-19 pneumonia [27,38]. As shown in Figure 3, the elevation of N/L ratio is highly pathognomonic in the era of COVID-19 and had direct correlated with stage severity [39,40].

These results could explain the cause of the low incidence of COVID-19 cases in Egypt. Because the recent estimated Egyptian population in 2020 was approximately 100 million inhabitants, nearly 84.6% are beneath the age of 50 years [41]. Moreover, in the current study, the younger age group had a low incidence of comorbidities; most of them were asymptomatic or had a mild grade of COVID-19 disease. Furthermore, they had a lower risk than above 50 years cases, to acquire (LRTI) COVID-19 pneumonia [23]. All these factors might explain why Egypt still has a low incidence of reported cases.

Furthermore, the Egyptian ministry of health did not obligate screening for COVID-19 due to the low incidence rate. Thus, we might assume that the younger population would acquire the COVID-19 in either asymptomatic or mild pattern. Addressing the features and landscape of the disease in a locality could represent the floor to understand the real-life situation and plan for management strategies accordingly. Finally, the current report could open the door for more extensive multicenter studies evaluating not only the characteristics and demography of the COVID-19 patients in Egypt but go in-depth for a more detailed evaluation of risk factors for disease prognosis and mortality.

Figure 3. Error bar chart comparing the mean values of neutrophil to lymphocyte (N/L) ratio between different stages of severity for COVID infection.



Conclusions

The COVID-19 infection has a dynamic behavior, and its characteristic presentation in Egypt was similar to the rest of the world. All pediatric COVID-19 cases were asymptomatic, and most of the young adult age group had a mild form of URTI COVID-19 infection. Most of the above 50 years age group had the symptomatic pattern in 78% of cases, and they had a higher risk for moderate to severe clinical presentations. COVID-19 pneumonia is more frequent among patients above 50 years with a history of risk factors such as diabetes, hypertension, and cardiac diseases. CT-chest, N/T ratio, and CRP act together as an integrated panel to diagnose symptomatic COVID-19 infection and correlate directly with case severity.

Acknowledgements

MK and NA conceptualized the idea and study design. DO performed the literature search. AA, HS, MG, AT, AS, and MB managed the patient follow up and data collection. NA, HE, and AF performed data analysis and interpretation. AF, AM, DO, and MK drafted the manuscript. MH provided the revision and critical appraisal of the manuscript. All authors approved the last version of the manuscript.

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