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Research Article

Epidemiological and Clinical Characteristics of COVID-19 Suspect Cases at the Triage of Ain Shams University Hospitals during the First Wave

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Abstract: Background: In December 2019, a cluster of patients with unexplained viral pneumonia was identified in Wuhan, China. Since March 11th 2020 the WHO declared COVID 19 as a pandemic with rising number of cases all over the world. **Aim of the work:** The aim of the study was to measure the percentages of possible, probable and provisionally excluded cases among the first 500 attendants of the triage of Ain Shams University Hospital and describe their epidemiological and clinical characteristics. **Patients and Methods:** This was a retrospective descriptive case series study including the first 500 patients attending the triage of Ain Shams University Hospitals from March 29th to May 31st. A constructed questionnaire in the form of a scoring system was used and data was collected through interviewing the patients after appropriate consent. **Results:** As regard the scoring system, 72.2% of patients had new onset of cough or old worsened cough in the previous 3 days, 59.2% had sore throat and 59% had dyspnea. Out of the 500 cases 33.2% were probable, 38.2% were possible and 28.2% were provisionally excluded. **Conclusion:** COVID-19 pneumonia usually occurred at an age younger than 47 years and it was more predominant in the male gender. The most common initial clinical presentations were new dry cough or chronic cough with worsening over the last 3 days, sore throat and/or runny nose and fever. Thirty-eight percent were classified as possible COVID-19 cases, and 33% were classified as probable.

Keywords: COVID-19, scoring system, Ain Shams University Hospitals, First Wave, Epidemiology

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1. Introduction

In December 2019, a cluster of patients with unexplained viral pneumonia was identified in Wuhan, China [1] and identified by researchers as a novel corona virus termed as Severe Acute Respiratory Syndrome Corona Virus-2 (SARS-CoV-2) [1]. When the numbers of infected people rapidly increased worldwide, the World Health Organization (WHO) declared the disease a pandemic on March 11, 2020 [2]. SARS-CoV-2 has infected over 600 million individuals and has caused the death of more than 6 million people and the numbers are still growing [3].

It was reported the first 41 cases confirmed to be infected by COVID-19 on January 2nd, 2020. Amongst; 13 cases were intensive care patients and 28 cases were non-intensive care patients. Almost all of them had bilateral lung ground glass opacities on computed

tomography (CT) imaging. Symptoms included fever in 98% of cases, cough in 76%, dyspnea in 55%, myalgia or fatigue in 44%, sputum production in 28%, headache in 8%, hemoptysis in 5%, and diarrhea in 3% of cases [4].

On January 2020, it was reported that 99 cases and in this case series it was found that the older males with co morbidities were more susceptible to COVID-19 infection [5] however similar results to study were found [4].

This study describes the sociodemographic and clinical characteristics of suspected COVID-19 patients attending hospital triage using COVID-19 scoring system to identify probable, possible or provisionally excluded cases.

The aims of the current study were:

i. To apply COVID-19 scoring system on Ain Shams University hospital triage attendants and measure the percentage of possible, probable and provisionally excluded cases among.
ii. To describe the epidemiological and clinical characteristics of suspected COVID-19 patients.

2. Patients and Methods

A retrospective case series study was performed where the records of the first 500 suspected cases attending the triage of Ain Shams University Hospitals in April and May 2020 were collected and analyzed.

Constructed interview questionnaire was used to collect personal data.

COVID-19 scoring system was used [6] to classify the first 500 patients. It includes the following items:

i. Epidemiological evidence of exposure to COVID-19 through either travelling or living in a country or area with confirmed cases of COVID-19 or contact with a confirmed case (3 points).
ii. **Clinical symptoms and signs (1-5 points):** Fever more than 37.4 Celsius (1 point), and/or sore throat with or without runny nose (1 point), and/or new dry cough or old dry cough worsened over the last 3 days (1 point), dyspnea (2 points).
iii. **Investigations (if available) (2 points each):**
    a. **CBC:** leucopoenia with or without lymphopenia.
    b. **Chest x-ray:** Ground glass pattern and/or peripheral patches and/or pleural effusion.
    c. **Oxygen tension:** If less than 95% by ABG or less than 92% by pulse oximeter.
    d. **Scoring:** A score of 6 or more means the case is probable, a score of 4 -5 means the case is possible, a score less than 4 means the case is provisionally excluded.
iv. **Steps of recruitment:** All patients attending the various departments of Ain Shams University hospitals were primarily directed to the triage unit for detection and redirection of suspected COVID-19 cases.

First, patients were assessed and sorted based on their symptoms and signs using the scoring system as described before. Then measurement of oxygen saturation was done. Checking available investigations including CBC, chest X-ray or CT chest were done. According to hospital policy-starting from Week 11- all patients with respiratory symptoms of more than 5 days' duration were asked to perform high resolution chest computed tomography (HRCT). Putting together the clinical signs and symptoms including the oxygen saturation, patient comorbidities, laboratory investigations and chest imaging results; probable and possible cases were directed either for home isolation with treatment or referred to Emergency department to be admitted for isolation [6]. The

study was approved by the Ethical and Scientific Committee of Ain Shams University Hospitals (FMASU M S 570/2021).

Data was collected and encoded using Microsoft Excel software. Data were then imported into Statistical Package for Social Sciences (SPSS version 20.0) software for analysis. According to the type of data, qualitative represented as numbers and percentages, while quantitative data represented by mean and standard deviation (SD).

3. Results

A total of 500 patient records were collected and coded for analysis. The mean age was 39.7 (SD 13.59) years and ranged between 7 years and 85 years. Most of cases aged between 26 and 45 years old (Table 1). Males represented 54.6% and females represented 45.4% of the total sample (Figure 1).

Table 1. Age distribution of patients attending COVID-19 Triage.

Age Group	Frequency	Percentage
Age Group 1 (6~10 years)	1	0.2%
Age Group 2 (11~15 years)	3	0.6%
Age Group 3 (16~20 years)	29	5.8%
Age Group 4 (21~25 years)	44	8.8%
Age Group 5 (26~30 years)	71	14.2%
Age Group 6 (31~35 years)	61	12.2%
Age Group 7 (36~40 years)	63	12.6%
Age Group 8 (41~45 years)	65	13%
Age Group 9 (46~50 years)	37	7.4%
Age Group 10 (51~55 years)	48	9.6%
Age Group 11 (56~60 years)	36	7.2%
Age Group 12 (61~65 years)	30	6%
Age Group 13 (66~70 years)	9	1.8%
Age Group 14 (71~75 years)	2	0.4%
Age Group 15 (76~80 years)	0	0%
Age Group 16 (81~85 years)	1	0.2%
Total	500	100%

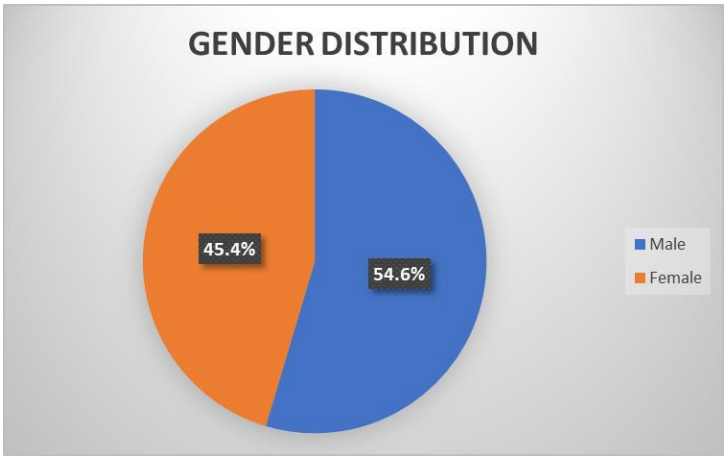

Figure 1. Gender distribution of patients attending COVID-19 Triage of Ain Shams University Hospitals.

Table 2. Residence of patients diagnosed at COVID-19 Triage of Ain Shams University Hospitals as suspect COVID-19 during the first wave.

Governorate	Number	Percentage
Total Cairo	440	88%
East Cairo	276	55.2%
North Cairo	71	14.2%
South Cairo	59	11.8%
West Cairo	34	6.8%
Giza	36	7.2%
Al Qalyubia	10	2%
Ash Sharqia	8	1.6%
Damietta	2	0.4%
Faiyum	2	0.4%
Aswan	2	0.4%
Total	500	100%

More than four-fifths of suspect patients were from Cairo.

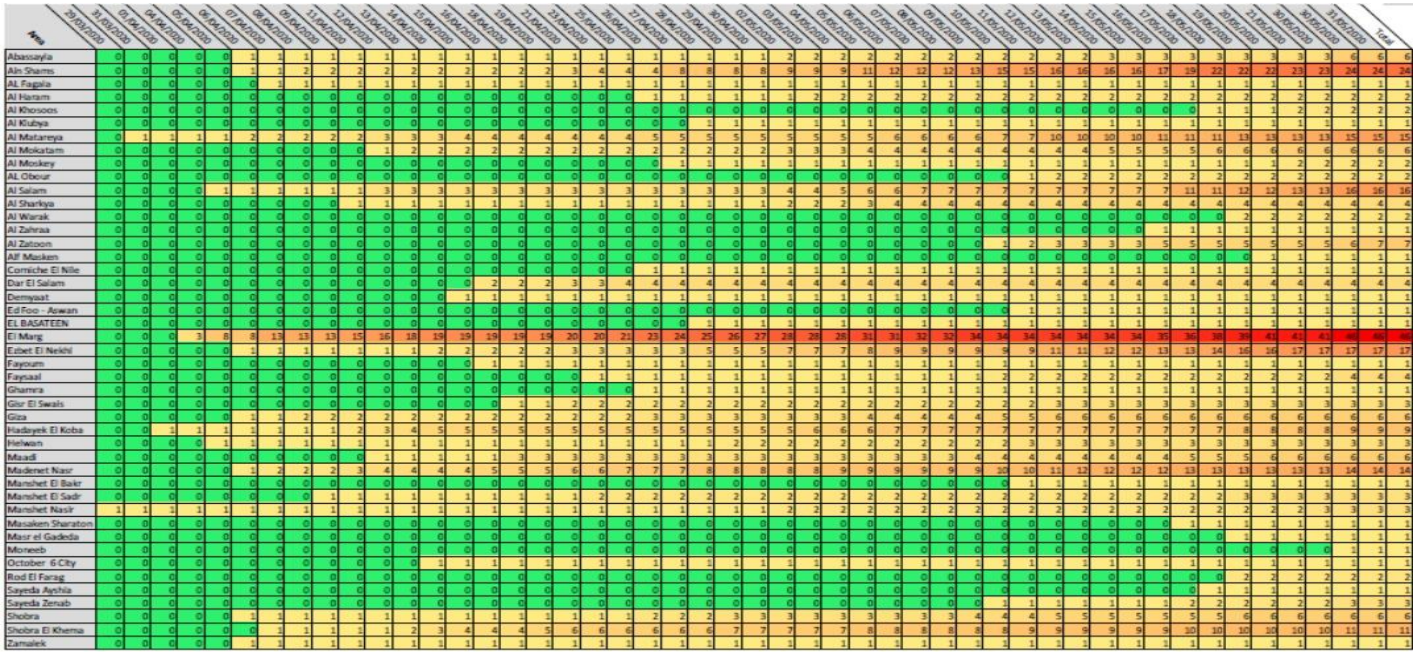

Figure 2. Number of suspect cases coming from each district in Cairo related to time, at COVID-19 Triage of Ain Shams University Hospitals during the first wave.

As regard the COVID-19 scoring system: out of the 500 cases only 0.2% admitted travelling to a country with confirmed COVID 19 cases however, 14% admitted living in an area with confirmed cases. 22.6% were in contact with a COVID 19 case (Table 3). Most of the patients had New Dry Cough or Old Dry Cough worsened over the preceding 3 days (72%), about 59% had dyspnea and sore throat and/or runny nose, while 57% of patients suffered from fever (Table 4). The CBC of 21% of cases showed leucopenia. About 9.4% of chest x-rays showed Ground Glass Pattern and/or Peripheral Patches and/or Pleural Effusion. Only 0.6% cases had an oxygen tension of less than 92%.

Table 3. Description of COVID-19 scoring system among patients.

Section I		Yes		No	
		Frequency	Percent	Frequency	Percent
Question 1	Travel to a Country or an Area with Confirmed Cases of COVID-19 in the last 14 Days. e.g., USA, UK, China, Italy, South Korea, Iran, Spain.	1	0.2%	499	99.8%
Question 2	Travel or Living in an Area or a District with Confirmed Cases of COVID-19 in the last 14 Days. e.g., Tourist Resorts in Hurghada or Luxor (Egypt).	70	14%	430	86%
Question 3	Contact with a Case of COVID-19, either isolated (quarantine or home) or admitted at a hospital.	113	22.6%	387	77.4%

Table 4. Second section of scoring system: Clinical symptoms of patients diagnosed at COVID-19 Triage of Ain Shams University Hospitals as suspect COVID-19 during the first wave.

Section II		Yes		No	
		Frequency	Percent	Frequency	Percent
Question 4	Fever more than 37.4ºC	286	57.2%	214	42.8%
Question 5	Sore Throat and/or Runny Nose	296	59.2%	204	40.8%
Question 6	New Dry Cough or Old Dry Cough worsened over the last 3 Days.	361	72.2%	139	27.8%
Question 7	Shortness of Breath or Dyspnea	295	59%	205	41%

Table 5. Third section of scoring system: Laboratory and imaging data of patients diagnosed at COVID-19 Triage of Ain Shams University Hospitals as suspect COVID-19 during the first wave.

Section III		Yes		No	
		Frequency	Percent	Frequency	Percent
Question 8	CBC with Leucopoenia (with or without lymphopenia)	105	21%	395	79%
Question 9	Chest X Ray: Ground Glass Pattern and/or Peripheral Patches and/or Pleural Effusion	47	9.4%	453	90.6%
Question 10	Oxygen Tension less than 95% (ABG) or Oxygen Saturation less than 92% (Pulse Oximeter)	3	0.6%	497	99.4%

Table 6. Classification of patients using the COVID-19 scoring system.

Variable	Frequency	Percent
Excluded (score less than 4)	141	28.2%
Possible (score of 4 -5)	191	38.2%
Probable (score of 6 or more)	166	33.2%
Confirmed by PCR	2	0.4%
	500	100%

4. Discussion

Coronavirus disease-2019 (COVID-19) has crossed borders rapidly around the world since its outbreak in December 2019, leading to more than 70 million cases in over 160 countries just up to 14 December 2020. Before the severe acute respiratory syndrome (SARS) outbreak due to severe acute respiratory syndrome coronavirus-1 (SARS-CoV-1) in 2003, coronaviruses were not considered a serious medical concern [2].

Several reports of COVID-19 have indicated that not all admitted patients were infected with SARS-CoV-2, highlighting the urgent need to determine the causes of fever and febrile illness to support the selection of more appropriate and effective treatment. Achieving an accurate differential diagnosis will help reduce the consumption of clinical resources while also improving the prevention and control of the pandemic [7].

The objectives of our study were to measure the percentage of possible, probable and provisionally excluded cases among patients attending the triage of Ain Shams University Hospitals using COVID-19 scoring system and describe their epidemiological and clinical characteristics. This was a retrospective case series study was performed where the records of the first 500 suspected cases collected between April and May of 2020. In the current study, the ave3rage age was 39.7 and most of the cases were between 26 and 45 years of age with only 1 case below the age of 10 years.

According to a study by ***Mousavi-Hasanzadeh et al.*** who described clinical, epidemiological, laboratory, and radiological characteristics and outcomes of patients with COVID-19 infection in Arak, Markazi province, Iran, the mean age of patients was 55.41 years [8].

Khan and colleagues described epidemiological and clinical characteristics of patients presenting with COVID-19 at the screening clinic of a tertiary care hospital in Peshawar, Pakistan. They reported that most of the positive cases were between 25 to 60 years old. They also reported that only five positive cases of less than 10 years of age were found in their study [9], and previous studies reported the same [10].

Another study carried out in India found the median age to be 33.4 and the majority of suspects were between 13 and 79 years of age [11]. Fewer cases were identified among children and infants [10].

On the other hand, in a retrospective single-center study of the first 100 individuals with suspected COVID-19 (between January 25 and March 29, 2020) admitted to San Lazaro Hospital (SLH), the national infectious diseases referral hospital in Manila, Philippines. It was reported that COVID-19 confirmed cases tended to be older [12].

It was reported that, according to the statistics of clinical cases, children seem to be less infected [13]. The infection is mainly concentrated in the age group of 31–59 years. Children and youth have been less infected, which may be due to other unknown reasons [13].

The median of age in our study was 39.7 which was comparable to the median age of cases in Wuhan reported by ***Huang et al.*** and ***Chen et al.***, which were 49.0 and 55.5 years, respectively [4,5]. ***Khan et al.*** reported that, the median age of patients in their study was 47 years [9] and ***Ombajo et al.*** reported that, the median age was 43 years, with 42% below the age of 40 [14]. Their patient population was also younger than that reported elsewhere, with a median age of the general population of 20 years compared with 45 in Italy and 44.9 in Spain, 38.2 in USA and 33 in Brazil, all countries that have seen significantly higher morbidity and mortality.

The median age of infected individuals was 34 years. The adult age group (19–59 years) was more affected by the infection.

Ahmad et al. found that the population demographics of Pakistan, according to the 1998 census, was suggesting that nearly 40% of the country's population comprises adults whereas 53% of the total population is less than 19 years of age and 5.54% of the total population is above 60 years of age [15]. Thus, most studies suggest that older middle-aged people are more predisposed to COVID-19 (median age of onset is about 55 years) [16].

In this study, 54.6% were males and 44.5% were females. In this regard, a study reported a male predominance (70.25%) [9]. Another study had similar findings. They reported that the majority of cases were men (64%) [14]. It was -as well- reported that most of the patients were males [8].

According to the meta-analysis by ***Yang et al.***, men were more likely to be infected with SARS-CoV-2 than women [17]. And the occurrence of the infection in females (19.1%) was less compared to the male (80.9%) population in the study by ***Huang et al.*** [4].

Even animal studies on male mice found them more susceptible to the SARS-CoV and MERS-CoV when compared to the female mice [18]. Explanations theorized that women are less likely to be infected than men, partly because of their more robust innate and adaptive immune responses [19]. There may be other behavioral and social differences that favor women, with prior studies suggesting women are more likely than men to follow hand-hygiene practices [20] and seek preventive care [21].

Yet, other studies like that by ***Liu et al.*** found no significant difference in the infection rate between men and women [13].

As regard the place of residence 88% (n=440) of patients came from Cairo governorate. About 55% (n=276) of which came from the districts of East Cairo as shown in the heat map (Figure 3) and 14.2% (n=71) from North Cairo, 11.8% (n=59) South Cairo and 6.8% (n=34) West Cairo districts. Other governorates included 7.20% from Giza (n=36), 2% (n=10) from Al-Qalyubia, 1.60% (n=8) from Al-Sharqiah, and only 0.4% (n=2) from each Aswan, Damietta and Faiyum.

Since Ain Shams University hospitals are considered a main tertiary hospital in the center of Cairo governorate, it was where most of the patients came. Early affected districts in Eastern part of Cairo (El-Marg, Ain Shams, El-Salam, etc.) are characterized by over crowdedness and low socioeconomic status which may be an explanation to why most attendants were from these areas.

Manila city in the Philippines suffered increased COVID-19 infections which were of concern. Given it is their most densely populated city with 71,263 persons per square kilometer with small dwelling sizes, social mixing due to extended families, overcrowding in slums, this poses a high risk of community transmission and may lead to large outbreak in the case of absence of public health interventions [22].

Regarding source of infection, it was reported that, only a few patients had been to Wuhan, while most of the other patients acquired the infection locally [13]. This confirmed the strong infectivity of SARS-CoV-2; therefore, controlling local clusters is key to prevent outbreaks from imported cases. We found similar results with only 1 patient admitted travel history to countries with confirmed cases in the last 14 days (0.20%). The number of patients travelling to or living in an area with confirmed cases of COVID-19 in the last 14 days was 70 (14%), and those who were in contact with a case of COVID-19 either in quarantine or admitted at a hospital were 112 (22.6%).

In Pakistan, a large proportion of early reported cases were tourists both internationally (18.1%) and domestically (20.66%). None of the cases had a history of travel from mainland China. Subsequently, 34 (28%) patients had family members in the same household, also SARS-C0V-2 positive. Thus, early detection and timely isolation is vital before a single case becomes a cluster [9].

Liu et al. reported that, cluster cases occurred mainly among family members which originated either from Wuhan travelers or those who came in contact with COVID-19 patients [13]. The origin of the virus could not be confirmed in five patients, and 12 patients had made contact with passengers traveling from Wuhan who were asymptomatic carriers.

Presentation of patients in our study was relatively similar to other work. We found 286 patients presented with fever (57.2%), 296 patients (59.2%) with sore throat and/or runny nose, 361 (72.2) patients had new onset of dry cough or old dry cough worsened over the last 3 days, and 295(59%) had shortness of breath. This is found in the results of

a study by ***Li et al.*** that found fever, cough, and fatigue to be the most common clinical manifestations in patients with COVID-19. Also, it was found that fever (72%) and cough (59.5%) were the dominant symptoms [9, 25]. Cough and fever were the most common symptoms in the study by ***Richardson et al.*** [23].

Adults with COVID-19 infection most commonly manifest fever, cough, and fatigue, which in some patients can be accompanied by runny nose, headache, and other symptoms ***[16]***. Myalgia, nausea, anorexia, sore throat, dizziness, redness of the eyes, and anxiety were also reported of COVID-19 infection [24]. The patients predominantly presented with fever and cough as reported earlier. Most patients had multiple symptoms. In few patients, fatigue or throat discomfort was the only symptom and some patients were asymptomatic. So, the absence of clinical symptoms cannot rule out the infection [5].

Fever, cough, and expectoration are the main clinical symptoms of COVID-19. However, it is particularly interesting to note that 13.2% patients showed no fever despite being infected. It was reported that, the most common symptoms included fever, cough, shortness of breath, muscle ache, and a headache, which is similar to the studies on COVID-19 patients in China [4, 8].

Our study showed that CBC of 105 patients (21%) showed leucopenia (with or without lymphopenia). This was in accordance with another which reported reduced lymphocytes compared to patients with other respiratory illnesses ($P<0.05$) [25].

Lymphopenia was found frequently in patients with COVID-19 [14]. Another study found that it predicted severe disease [26].

Mousavi-Hasanzadeh et al. reported that almost half of the patients had lymphopenia. Lymphopenia was a common laboratory abnormality seen in the initial disease. Because of this reason, lymphopenia was used as a clue to diagnose COVID-19 [8].

Lymphopenia may result either from suppression of the bone marrow, direct infection and destruction or a cytotoxic-mediated killing of lymphocytes. A functional exhaustion of antiviral lymphocytes has also been reported [27]. The current study showed that, the Chest X Ray of 47 patients (9.4%) showed ground glass pattern and/or peripheral patches and/or pleural effusion. ***Cleverly et al.*** study mentioned that the chest radiograph may be normal in COVID-19 pneumonia so it has low sensitivity. Changes include ground glass appearance and tend to be bilateral and peripheral with or without consolidation in early disease. However, chest CT is the most sensitive imaging method [28].

Mousavi-Hasanzadeh et al. reported that, according to the CT findings, most patients presented with bilateral pneumonia and the most common chest CT abnormality of patients was bilateral mixed ground-glass opacities with consolidation [8], which was confirmed by studies [29, 30] and other radiological studies regarding COVID-19 [31].

Computed tomography of the chest is a better modality of chest imaging. It showed positive COVID-19 findings in RT-PCR negative patients [32]. It was found that, almost all of the cases had bilateral lung ground glass opacities on computed tomography imaging [4, 5].

Our results revealed that, the oxygen saturation was less than 92% in only 3 patients (0.6%). This is expected because most patients attending the triage suffered mild to moderate disease. However; the critical patients were referred to the emergency. According to ***Petrilli et al.*** measuring the level of hypoxia at the time of presentation was proven to be the most reliable method of recognizing critical illness and the need for admission, intensive care or mechanical ventilation [33]. Also, the use of home pulse oximetry was found to be of great benefit in following up COVID-19 pneumonia, it was found that 50% of patients who returned for hospital admission had no worsening of symptoms but returned because of silent hypoxia discovered by close pulse oximetry monitoring [34].

In the current study, according to the scoring system only 2 cases (0.4%) came out as confirmed as they had performed the PCR test, 191 (38%) were possible cases, 166 (33%) were probable cases and 141 cases (28%) were provisionally excluded. Not all patients were asked to perform PCR test because it was expensive and time consuming. In this regard, a study reported that, confirmed COVID-19 accounted for only approximately 17.2% of the 134 suspected COVID-19 cases [25].

A study reported 121 cases out of total 845 patients tested contributed a positivity rate of 14.3% in the tested cohort [9].

In conclusion, COVID-19 pneumonia usually occurred at ages between 26 and 47 years and it was more predominant in the male gender. The most common initial clinical presentations included new dry cough or old dry cough worsened over the last 3 days, sore throat and/or runny nose and fever.

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