Title: Clinical course and potential predicting factors of pneumonia of adult patients with coronavirus disease 2019 (COVID-19): A retrospective observational analysis of 193 confirmed cases in Thailand

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Abstract

**Background:** Clinical spectrum of COVID-19 has been unclear, especially with regard to the presence of pneumonia. We aimed to present clinical course of all laboratory-confirmed adult COVID-19 patients and to identify potential predicting factors of pneumonia.

**Methods:** We conducted a retrospective study among adult patients with confirmed COVID-19 who were hospitalized at Bamrasnaradura Infectious Diseases Institute, Thailand, regardless of their disease severity, between January 8 and April 16, 2020. We described the full picture of COVID-19, defined definite outcomes and evaluated factors associated with pneumonia.

**Results:** One-hundred-and-ninety-three patients were included. The median (IQR) age was 37.0 (29.0-53.0) years, and 58.5% were male. Of whom, 189 (97.9%) recovered and 4 (2.1%) died. More than half (56%) of the patients were mild, 22% were moderate, 14% were severe, and 3% were critically ill. Asymptomatic infection was found in 5%. The overall incidence of pneumonia was 39%. Bilateral was more prevalent than unilateral pneumonia (65% vs. 35%). Increasing age (OR 2.60 for every 10-year increase from 30 years old; 95% CI, 1.68 to 3.97; p<0.001), obesity (OR 9.17; 95% CI, 2.11 to 39.89; p=0.003), and higher temperature at presentation (OR 4.66 per one-degree Celsius increase from 37.2 degree Celsius; 95% CI, 2.32 to 9.34; p<0.001) were potential predicting factors of COVID-19 pneumonia. Severe cases had a longer viral RNA shedding duration than the non-severe cases. The longest observed duration of viral RNA shedding was 45 days.

**Conclusion:** Across different disease severities, most patients with COVID-19 in Thailand had a good prognosis. COVID-19 pneumonia was found in one-third of the hospitalized patients. Potential predicting factors included old age, obesity, fever at presentation.
Keywords: Clinical course, pneumonia, risk factor, COVID-19, SARS-CoV-2, Thailand

Introduction

The Coronavirus Disease 2019 (COVID-19) is the most recent emerging infectious disease caused by the novel Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) [1]. First identified in China in December 2019 [2], COVID-19 has become a global menace and momentously impact on the health systems of affected countries. While several studies have attempted to describe the patients’ characteristics, disease severity, and treatment outcomes [3-8], their findings have been dominated by patients with moderate and severe illness. Most of the disease severity assessment was based on an evaluation at the time of admission, likely for triage purpose, although temporal clinical progression during hospitalization was well documented [9, 10] and could differ from the initial severity assessment on admission or at discharge. Also, the clinical outcomes (recovery or death) in the published reports were not fully established due to a number of the patients remained hospitalized at the time of data analysis [3-6, 11, 12]. Thus, the full picture and the final clinical outcome, especially recovery rate, of patients with COVID-19 are still uncertain.

COVID-19 have been categorized to a range of clinical severity; ie, asymptomatic, mild, moderate (non-severe pneumonia), severe (severe pneumonia), and critical illness [13, 14]. Data from a large cohort from China showed 81% of patients had a mild disease while 14% were severe and 5% developed critical illness [15]. Nevertheless, patients who were considered ‘mild’ in the Chinese nationwide survey could vary from minimal symptoms without lung involvement to early pneumonia. The details on COVID-19 patients with mild illness and mild pneumonia are lacking. ‘Non-severe’ cases were excluded in a recent randomized controlled trial on Favipiravir.
The incidence and risk factors of pneumonia of any severity in SARS-CoV-2 infected patients are also unknown. Understanding the full picture of COVID-19, not only more severe end of the disease, would facilitate the public health system to estimate the burden of the disease and early identify vulnerable patients.

On January 13, 2020, Thailand reported a confirmed female case of COVID-19, the first recorded case outside of China [17]. She was admitted to the Bamrasnaradura Infectious Diseases (BIDI), which is the responding hospital for COVID-19 outbreak of Ministry of Public Health, Thailand. As of May 29, 2020, 3,076 cases due to COVID-19 had been reported in Thailand [18].

This study was aimed to present details of all adult hospitalized patients with laboratory-confirmed COVID-19 who admitted to our institute regardless of their disease severity. We described the clinical course and final outcome (recovered or died) of the disease. Potential predicting factors of COVID-19 pneumonia were also investigated.

Methods

Patients

The BIDI is the main public health institution under the Department of Disease Control, Ministry of Public Health of Thailand responsible for testing and treatment of emerging infectious disease including COVID-19. All individuals who were diagnosed to have COVID-19, according to the WHO interim guidance [13] were all admitted at the institute, regardless of their disease severity. The institute’s protocol appointed to obtain nasopharyngeal and throat swab samples tested for SARS-CoV-2 by real-time reverse-transcription–polymerase-chain-reaction (RT-PCR) assay every other day since admission, until two consecutive negative results at least 24 hours apart.
were achieved. The patients were discharged if they met the following criteria: 1) resolution of fever without the use of antipyretics ≥ 48 hours, and 2) improvement in respiratory symptoms with oxygen saturation ≥ 95% while they were breathing ambient air, and 3) samples from nasopharyngeal and throat swab tested negative for SARS-CoV-2 by RT-PCR. We conducted a retrospective cohort study among adult patients (≥ 18 years) with laboratory-confirmed COVID-19 who hospitalized at the BIDI, between January 8 and April 16, 2020. The hospital outcomes were monitored until discharges or death. The study was reviewed and approved by the BIDI’s Institutional Review Board (S012h_63_ExPD).

Definitions

A laboratory-confirmed COVID-19 was defined as detecting SARS-CoV-2 RNA in nasopharyngeal swab specimens by RT-PCR assay described below. Fever was defined as an axillary temperature of ≥ 37.3°C. Defervescence was defined as resolution of fever (T<37.3) without the use of fever-reducing medications. Pneumonia was diagnosed by the presence of respiratory symptoms and opacity on chest radiography. Acute Respiratory Distress Syndrome (ARDS) was determined according to the Berlin definition [19]. Acute Kidney Injury (AKI) was defined according to KDIGO guideline [20].

Real-Time Reverse-Transcription–Polymerase-Chain-Reaction Assay for SARS-CoV-2

The respiratory specimen was collected from nasopharyngeal and oropharyngeal using synthetic fiber or flocked swabs. The swabs from both sites were placed in the same tube to increase viral detection. For the transport of samples, viral transport medium containing anti-fungal and antibiotic supplements were used. Sputum specimen was collected from the patients with lower respiratory symptoms.
Total nucleic acid or viral RNA was extracted from the specimens and tested with conventional nested RT-PCR for coronavirus family of the first two novel coronavirus cases in Thailand. Both cases were confirmed of Wuhan human novel coronavirus 2019 by two reference laboratories—the Thailand National Institute of Health, Ministry of Public Health and Emerging Infectious Disease Health Sciences Center, King Chulalongkorn Memorial Hospital, Thai Red Cross Society—using whole-genome sequencing comparison to the Wuhan reference virus (posted in GenBank, accession number MN908947). After Wuhan human novel coronavirus 2019 sequence data were available, real-time RT-PCR with SARS-CoV-2-specific primers and probes were developed to detect the specific gene areas using the WHO protocol. Real-time RT-PCR testing was based on fluorescent PCR and probes consist of a reporter dye and quencher dye. The PCR instrument was automatically amplified and detect the fluorescent signal. To avoid contamination, non-template or negative controls were included in every PCR run. Human housekeeping gene was used as an internal control to monitor the process of specimen collection and extraction. To confirm COVID-19 infection at the beginning phase in January and February, the SARS-CoV-2 RNA had to be detected by two independent laboratories.

At BIDI, we used two RT-PCT techniques to detect SARS-CoV-2. First, the COVID-19 Coronavirus Real Time PCR Kit (Jiangsu Bioperfectus Technologies Co., Ltd.; WHO Product Code JC10223-1NW-25T or JC10223-1NW-25T) was used for detecting the Open Reading Frame gene region (ORF 1ab) and viral nucleocapsid region (N gene) according to China CDC recommendation. Second, the Real-Time Fluorescence Detection RT-PCR kit (BGI technology) was concurrently used for detecting the ORF 1ab gene. After March 31, 2020, Cobas® SARS-CoV-2 qualitative assay for use on the Cobas® 6800/8800 Systems (Roche Molecular Systems,
Inc.) has been used at the institute. Both ORF 1ab and E gene were designed for SARS-CoV-2 detection according to WHO recommendation.

Data collection

Demographic, epidemiological, clinical, and hospital courses, as well as investigation and treatment data of all consecutive laboratory-confirmed cases, were extracted from medical records and manually reviewed by four attending physicians responsible for the COVID-19 patients at BIDI. Chest radiography interpretation was based on radiologist’s report and independently rechecked by a pulmonologist during the data extraction. The severity of illness of each patient was evaluated at the time of discharge or death by the study team.

Clinical Outcomes

The patients who met the discharged criteria as mentioned above were considered as recovery. All confirmed cases who died during hospitalization whether follow-up RT-PCR results turned negative or not were considered as death. The severity of illness of each patient was classified following the report of the WHO-China joint mission on Coronavirus Disease 2019 [21]: mild (the clinical symptoms were mild, and there was no sign of pneumonia on imaging), moderate (fever and respiratory symptoms with radiological findings of pneumonia, but without features of severe pneumonia), severe (respiratory rate $\geq 30$ breaths/minute, oxygen saturation $\leq 93\%$, PaO$_2$/FiO$_2$ ratio $<300$, and/or lung infiltrates $>50\%$ of the lung field within 24-48 hours), and critical (respiratory failure, shock, and/or multiple organ failure). Asymptomatic infection was defined as patients had no symptoms or signs throughout the course of the disease. Patients were categorized into two groups based on pneumonia detection (pneumonia vs non-pneumonia).

Statistics
Descriptive data are presented as mean [standard deviation (SD)], median [interquartile range (IQR)] and frequencies (%), as appropriate. No imputation was made for missing data. The mean values of continuous variables with normal distribution between the two groups were compared using Student’s t-test. Categorical variables were compared using the Chi-squared test and Fisher’s exact test, as appropriate. Logistic regression analyses were used to determine factors associated with pneumonia in patients with COVID-19. We excluded variables from the logistic model if their nature was highly subjective (presenting symptoms, which was self-reported), if the data were not available ≥ 20% of all cases (blood chemistry results), and if they were correlated with pneumonia (high respiratory rate, low oxygen saturation). Variables with p < 0.05 on univariate analysis were included in the multiple logistic regression model. All statistical analyses were performed using SPSS version 26 (IBM SPSS Statistics Subscription Trial). p < 0.05 was considered to indicate statistical significance.

Results

Patients’ Characteristics

A total of 195 laboratory-confirmed SARS-CoV-2 infected patients, inclusive of the 11 patients previously reported during the early phase of COVID-19 outbreak [22], were admitted to the institute during the study period. One hundred and ninety-three (99.0%) were reached the study outcomes; two patients were referred to other hospitals before viral RNA clearance according to patients’ request. Two consecutive negative RT-PCR results from nasopharyngeal and throat swab were attained in 82.4% and single negative results were in 17.6%. The median (IQR) age of the patients was 37.0 (29.0-53.0) years, 58.5 % were males, and 91.2% were Thai. The median body mass index, BMI (IQR) was 23.3 (20.4-25.9) kg/m² and 12.7% were fell within the obese
range. One-quarter of the patients had one or more coexisting medical conditions, which found
less frequently among mild cases. Hypertension, diabetes, and dyslipidemia were the most
common comorbidities. Of all cases, 79.3% were local transmission while 20.7% were imported
cases. The epidemiological data showed that 34.7% had a history of contact to confirmed
COVID-19 cases, 20.7% had arrived from affected countries with widespread or ongoing
transmission of COVID-19 within 14 days before the onset of illness, 17.1% had attended or
worked at crowded places, 22.8% were involved with a boxing stadium cluster, and only one
patient was linked with a healthcare facility (Table 1).

At Presentation

Contact investigation was able to identify the date of disease contact in 83 (43.0%) patients. The
median (IQR) incubation period among this group was 5.5 (3.0-8.0) days. The median (IQR)
time from onset of illness to the first visit was 3.0 (2.0-6.0) days. Baseline clinical characteristics
of the patients are shown in Table 1. Fever (62.7%) was the most common presenting symptoms,
followed by dry cough (49.2%). Coryza, including rhinorrhea and sore throat, were reported in
28% of cases. Gastrointestinal symptoms were initially presented in less than 10% of the
subjects. At presentation, only 78 (39.8%) of patients were found to have a fever by a
thermometer. The mean body temperature of mild cases was 37.0 degrees Celsius, whereas of
moderate and severe cases were more than 37.5 degree Celsius. The patients with moderate and
severe disease had more prominent laboratory abnormalities (lower absolute lymphocyte and
platelet count). Rapid influenza diagnosis test was done in 141 (73.0%) patients; only one patient
tested positive for influenza A. Chest radiography revealed no opacity in 80.8%, unilateral
opacity in 8.8%, and bilateral opacities in 10.4% of the patients.
During Hospitalization

The median (IQR) time from onset of illness to hospitalization was 5.0 (3.0-7.0) days. Pneumonia was detected in 75 (38.9%) patients, upon admission in 49.3% and during hospitalization in 50.7%. Among 75 cases with pneumonia, 34.7% were unilateral and 65.3% were bilateral. The median (IQR) time from onset of illness to pneumonia detection was 7.0 (5.0-9.0) days. Fever was present in only 49.2% of all cases but detected in 88% of patients with pneumonia. Among febrile patients, non-pneumonia (mild) cases had a mean of highest temperature during hospitalization lower than of those who had pneumonia (37.9 vs 38.8 degrees Celsius). Of 121 patients reported fever on admission, 44 (36.4%) had no fever for the entire length of hospital stay. Of 72 patients reported no fever on admission, 18 (25.0%) develop a fever during hospitalization. The median duration from admission to defervescence was 5.0 (3.0-9.0) days. The median day to defervescence in mild cases was shortest (3.0 days) (Table 2). Seventy-four patients (38.3%) received supportive treatment while 61.7% also received therapeutic options listed in the Thai treatment guideline for cases of COVID-19 infection (Table 2). Thirty-two patients (16.6%) were transferred to ICU. The median (IQR) time from illness onset to ICU admission was 8.0 (5.3-10.0) days. Oxygen saturation of less than 95% was found in 18.1% of cases, whereas 13.0% experienced a respiratory rate of ≥ 24 breaths/min; these merely occurred in the pneumonia group. The median time (IQR) from symptom onset to oxygen saturation of less than 95% and respiratory rate ≥ 24 breaths/min were 8.0 (7.0-9.0) and 9.0 (6.0-11.0) days, respectively. Supplemental oxygen by nasal cannula or face mask was administered in 18.7%, high-flow oxygen in 4.7% and mechanical ventilation in 2.6% of all patients. The median time (IQR) from illness onset to intubation was 9.0 (7.0-12.5) days. The median (IQR) duration of oxygen therapy was 5.0 (2.5-11.0) days. More than two weeks of oxygen therapy was...
required in critical cases. Moderate to severe ARDS was found in 3.1% whereas 3.6% of the patients developed AKI. The median length (IQR) of hospitalization was 12.0 (7.5-19.0) days. The median duration of viral RNA shedding after the onset of symptom was 16.0 (11.0-24.0) days. Severe cases had a longer viral shedding duration than the non-severe cases (Table 2). The longest observed duration of viral shedding was 45 days.

**Clinical Outcomes and Predicting Factors of Pneumonia**

Of all cases, 189 (97.9%) had recovered and discharged, whereas 4 (2.1%) were dead. The degree of disease severity was classified as asymptomatic infection in 5.2%, mild cases in 55.9%, moderate (non-severe pneumonia) cases in 22.3%, severe (severe pneumonia) cases in 13.5%, and critical cases 3.1% (Fig 1). According to the Chinese CDC definition [15], 83.4% of the patients were considered mild, 13.5% were severe, and 3.1% were critical. The median time (IQR) from the onset of illness to death was 30.0 (18.0-49.5) days.

Table 3 demonstrates that patients with pneumonia were older (p<0.001), more likely to be male (p=0.001), obese (p=0.001), different in many presenting symptoms (p<0.05) than those without pneumonia. Cases with pneumonia also had more comorbidities (p<0.001), higher body temperature (p<0.001), and lower oxygen saturation at presentation (p<0.001) than the non-pneumonia cases. Patients without pneumonia frequently complained of a runny nose (p=0.022) and sore throat (p=0.003) than those with pneumonia. Cases with pneumonia also had a higher proportion of febrile illness during hospitalization (p<0.001), longer duration of defervescence (p<0.001), longer hospital stay (p<0.001), and longer viral shedding duration (p<0.001) than patients without pneumonia.
As summarized in Table 4, age (OR 2.60 for every 10-year increase from 30 years old; 95% CI, 1.68 to 3.97; p<0.001), obesity (OR 9.17; 95% CI, 2.11 to 39.89; p=0.003), and body temperature at presentation (OR 4.66 per one degree Celsius increased from 37.2 degree Celsius; 95% CI, 2.32 to 9.34; p<0.001) were significantly associated with COVID-19 pneumonia.

**Discussion**

We described the clinical spectrum and outcomes of 193 COVID-19 patients admitted at a national infectious institute in Thailand. More than half of the patients had a mild illness and the recovery rate of our cohort was 97.9% with only 2.1% case fatality rate—only four deaths were observed in six critically ill patients. The overall incidence of pneumonia was 38.9%, of which 57.3% were not severe. Increasing age, obesity, and higher body temperature were potential predicting factors of pneumonia in SARS-CoV-2 infected patients.

Our cohort included laboratory-confirmed COVID-19 patients hospitalized regardless of the disease severity. Findings from our study could be representative of the patients in all disease spectrum from the first presentation through the final clinical outcomes. A wide range of mortality of COVID-19 patients from 0 to 28% reported in previous studies [3-5, 8, 9, 11, 12, 23] was resulted from inclusion bias to either mild or severe end of the disease as well as narrow observation period.

Approximately 40% of patients with SARS-CoV2 infection developed pneumonia. This was much lower than incidence of pneumonia from SARS-CoV-1 (78-90%) [24, 25]. We also found bilateral was more prevalent than unilateral pneumonia, which was different from SARS [26]. Older age was widely recognized to associate with worse pneumonia [11, 27-29]. However, obesity has been less explored so far. Obesity can impair immune responses to viral infection
Kass, et al. found younger individuals with COVID-19 admitted to hospital were more likely to be obese [32]. Chen, et al. reported those with obesity were more likely to have severe condition [29]. We identified obesity was significantly associated with COVID-19 pneumonia.

We found that fever was not a hallmark of COVID-19 but fever on admission was significantly associated with pneumonia in the multivariate analysis. Even though fever was the most common presenting symptom, patients with mild disease were less present with fever than those with moderate to severe disease. Among cases with mild severity, only 29 (48.3%) of 60 cases who reported fever had a fever during hospitalization. With the median time from illness onset to the admission of five days, half of the febrile patients with mild COVID-19 might have had a fever for less than five days. Furthermore, we observed that patients with the mild disease more frequently had sore throat and rhinorrhea when compared with those who were moderate to severe types. These may indicate that the virus is limited to the upper respiratory tract in patients with mild illness. Of note, some patients with mild disease were advanced age and obese.

Few studies reported on the proportion of asymptomatic infection. Our study revealed 13 patients who were asymptomatic at presentation, but three of them subsequently developed symptoms and recategorized as presymptomatic. Hence, the asymptomatic infection was estimated to be 5% in our cohort, which differs from the previously published reports in other settings (17.9-42.3%) [33, 34]. More information on a real prevalence of asymptomatic infection among SARS-CoV-2 infected patients is needed. Interestingly, 30% of asymptomatic cases in our cohort were more than 50 years of age. Determinants of disease severity among the elderly required further investigation.
We did not intend to demonstrate the efficacy of a specific treatment on COVID-19. Patients with mild to moderate disease received only supportive care and were recovered and able to discharge, suggesting the self-limited nature of the non-severe cases. While the current randomized trials on chloroquine, hydroxychloroquine, and lopinavir/ritonavir were unable to demonstrate treatment benefit [35-37], supportive care is crucial for COVID-19 patients with the mild or moderate illness.

Understanding the full spectrum of COVID-19 is essential for estimating the proportion of severe COVID-19 cases that require a large amount of healthcare resources. Demand for hospital inpatient and ICU beds could be better predicted to mitigate the overwhelming hospital burden after easing COVID-19 restriction. Although individuals without risk factors who present with mild illness are generally not required hospitalization, some of them might subsequently deteriorate.

This study has several limitations. First, the findings were based on a relatively small sample size from a single center may not be generalizable to other settings. However, the number of patients throughout the disease spectrum was comparable with those of nationwide survey of China. This might be suggestive of a good sample group. Second, the study was prone to have recall bias because of retrospective nature. Third, not all blood chemistry studies were performed in all patients and several non-routine tests (eg, serum LDH, C-reactive protein, IL-6 level) were not investigated. Fourth, we used chest radiograph as radiologic evidence of pneumonia. As chest radiograph is less sensitive than computed tomography, the minimal pneumonia might be missed. Likewise, arterial blood gas was evaluated only in critical cases, the incidence of ARDS may not be correctly estimated. Lastly, our institute has no testing facility on the viral load of
SARS-CoV-2 so that the duration of viral RNA shedding may not represent the duration of viral viability.

In conclusions, the majority of patients with COVID-19 had mild illness. The incidence of pneumonia of any severity was 39% (non-severe in 22%, severe in 14%, critical in 3%). Most patients had a good prognosis. Case fatality rate in our cohort was 2.1%. Increasing age, obesity, and higher temperature at presentation were potential predictive factors of COVID-19 pneumonia.

Author contributions

WA-P and SW had roles in the study design, data collection, data analysis, data interpretation, and literature search. LC and NP collected and interpreted data. The project was administered by AV. WA-P, SW, LC, NP, and SU wrote the manuscript. KP, WM and WP contributed to critical revision of the manuscript.

Declaration of Competing Interest

None to declare

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Table 1. Baseline characteristics and initial findings of the study patients

| Characteristics and variables | All (n=193) | Asymptomatic (n=10) | Mild (n=108) | Moderate (n=43) | Severe (n=26) | Critical (n=6) |
|------------------------------|-------------|---------------------|-------------|----------------|-------------|--------------|
| Age, years, median (IQR)     | 37.0 (29.0-53.0) | 43.0 (31.3-56.3) | 32.0 (26.0-40.5) | 48.0 (34.0-59.0) | 52.5 (46.5-56.3) | 64.0 (41.8-72.3) |
| Distribution, no (%)         |             |                     |             |                |             |              |
| 20-29 years                  | 53 (27.5)   | 2 (20.0)            | 44 (40.7)   | 6 (14.0)       | 1 (3.8)     | 0            |
| 30-39 years                  | 53 (27.5)   | 2 (20.0)            | 37 (34.3)   | 10 (23.3)      | 3 (11.1)    | 1 (16.7)     |
| 40-49 years                  | 30 (15.5)   | 3 (30.0)            | 14 (13.30)  | 8 (18.6)       | 4 (15.4)    | 1 (16.7)     |
| 50-59 years                  | 34 (17.6)   | 1 (10.0)            | 10 (9.3)    | 9 (20.9)       | 13 (50.0)   | 1 (16.7)     |
| 60-69 years                  | 15 (7.8)    | 2 (20.0)            | 3 (2.8)     | 9 (20.9)       | 1 (3.8)     | 0            |
| 70-79 years                  | 8 (4.1)     | 0                   | 0           | 1 (2.3)        | 4 (15.4)    | 3 (50.0)     |
| Sex, no (%)                  |             |                     |             |                |             |              |
| - Male                       | 113 (58.5)  | 5 (50.0)            | 53 (49.1)   | 32 (74.4)      | 17 (65.4)   | 6 (100)      |
| - Female                     | 80 (41.5)   | 5 (50.0)            | 55 (50.9)   | 11 (25.6)      | 9 (34.6)    | 0            |
| Body Mass Index (BMI), kg/m², median (IQR) | 23.3 (20.4-25.9) | 22.8 (21.7-29.4) | 21.6 (19.3-24.6) | 25.4 (22.6-31.1) | 25.1 (22.9-29.8) | 24.2 (21.5-25.5) |
| Distribution of BMI (n=173), no (%) |             |                     |             |                |             |              |
| - <18.5                      | 17 (9.8)    | 1 (14.3)            | 15 (14.9)   | 0              | 1 (4.2)     | 0            |
| - 18.5-24.9                  | 99 (57.2)   | 3 (42.9)            | 66 (65.3)   | 16 (45.7)      | 10 (41.7)   | 4 (66.7)     |
| - 25.0-29.9                  | 35 (20.2)   | 2 (28.6)            | 15 (14.9)   | 9 (25.7)       | 7 (29.2)    | 2 (33.3)     |
| - ≥30.0                      | 22 (12.7)   | 1 (14.3)            | 5 (5.0)     | 10 (28.6)      | 6 (25.0)    | 0            |
| Nationality, no (%)          |             |                     |             |                |             |              |
| - Thai                       | 176 (91.2)  | 7 (70.0)            | 101 (93.5)  | 37 (86.0)      | 25 (96.2)   | 6 (100)      |
| - Non-Thai                   | 17 (8.8)    | 3 (30.0)            | 7 (6.5)     | 6 (14.0)       | 1 (3.8)     | 0            |
| Type of infection, no (%)    |             |                     |             |                |             |              |
| - Imported cases             | 40 (20.7)   | 5 (50.0)            | 19 (17.6)   | 12 (27.9)      | 4 (15.4)    | 0            |
| - Local transmission cases   | 153 (79.3)  | 5 (50.0)            | 89 (82.4)   | 31 (72.1)      | 22 (84.6)   | 6 (100)      |
| Transmission link, no (%)    |             |                     |             |                |             |              |
| - Contact with confirmed cases | 67 (34.7)  | 4 (40.0)            | 47 (43.5)   | 12 (27.9)      | 4 (15.4)    | 0            |
| - Arrived from countries with widespread transmission of COVID-19 within 14 days before onset of | 40 (20.7)   | 5 (50.0)            | 19 (17.6)   | 12 (27.9)      | 4 (15.4)    | 0            |
| Illness                                      | No (%) | Yes (%) |
|---------------------------------------------|--------|---------|
| Attended or worked at crowded places        | 33 (17.1) | 21 (19.4) | 6 (14.0) | 4 (15.4) | 2 (33.3) |
| Boxing stadium clusters                     | 44 (22.8) | 17 (15.7) | 12 (27.9) | 11 (42.3) | 3 (50.0) |
| Healthcare facility                         | 1 (0.5) | 0 | 0 | 1 (3.8) | 0 |
| Unknown                                     | 8 (4.1) | 0 | 4 (93.7) | 1 (2.3) | 6 (7.7) | 1 (16.7) |
| Smoking (n=157), no (%)                     |        |        |        |        |        |
| Never                                       | 128 (81.5) | 66 (80.5) | 32 (80.0) | 19 (86.4) | 3 (75.0) |
| Ever                                         | 29 (18.5) | 16 (19.5) | 8 (20.0) | 3 (13.6) | 1 (25.0) |
| Alcohol drinking (n=164), no (%)           |        |        |        |        |        |
| No                                           | 112 (68.3) | 55 (64.7) | 28 (84.0) | 21 (84.0) | 3 (60.0) |
| Yes                                          | 52 (31.7) | 30 (35.3) | 13 (31.7) | 4 (16.0) | 2 (40.0) |
| Coexisting conditions, no (%)               |        |        |        |        |        |
| Any*                                         | 48 (24.9) | 10 (9.3) | 16 (37.2) | 15 (57.7) | 4 (66.7) |
| Diabetes                                     | 16 (8.3) | 3 (2.8) | 2 (4.7) | 7 (26.9) | 3 (50.0) |
| Hypertension                                 | 31 (16.1) | 4 (3.7) | 11 (25.6) | 10 (38.5) | 3 (50.0) |
| Dyslipidemia                                 | 10 (5.2) | 2 (1.9) | 3 (7.0) | 3 (11.5) | 1 (16.7) |
| Allergy                                      | 2 (1.0) | 1 (0.9) | 0 | 1 (3.8) | 0 |
| Chronic pulmonary diseases                   | 3 (1.6) | 1 (0.9) | 2 (4.7) | 0 | 0 |
| Chronic heart diseases                       | 2 (1.0) | 0 | 1 (2.3) | 1 (3.8) | 0 |
| Chronic liver diseases                       | 5 (2.6) | 1 (0.9) | 3 (7.0) | 1 (3.8) | 0 |
| HIV infection                                | 2 (1.0) | 1 (0.9) | 0 | 1 (3.8) | 0 |
| Angiotensin-converting enzyme inhibitors use, no (%) | 6 (3.1) | 3 (2.8) | 1 (2.3) | 1 (3.8) | 1 (16.7) |
| Angiotensin-receptor blockers use, no (%)    | 11 (5.7) | 2 (20.0) | 1 (0.9) | 6 (14.0) | 2 (7.7) | 0 |
| Days from onset of illness to the first visit, median (IQR) | 3.0 (2.0-6.0) | 3.0 (2.0-6.0) | 3.0 (1.0-7.0) | 4.5 (1.0-6.3) | 4 (2.8-5.5) |
| Presenting symptoms*, n (%)                  |        |        |        |        |        |
| Fever                                        | 121 (62.7) | 60 (55.6) | 33 (76.7) | 23 (88.5) | 5 (83.3) |
| Dry cough                                    | 95 (49.2) | 50 (46.8) | 25 (58.1) | 18 (69.2) | 2 (33.3) |
| Productive cough                             | 41 (21.2) | 22 (20.4) | 8 (18.6) | 7 (26.9) | 4 (67.7) |
| Shortness of breath                          | 25 (13.0) | 8 (18.6) | 8 (18.6) | 8 (30.8) | 1 (16.7) |
| Sore throat                                  | 54 (28.0) | 42 (38.9) | 10 (23.3) | 1 (3.8) | 1 (16.7) |
| Symptom                        | Count (%) | Count (%) | Count (%) | Count (%) | Count (%) | Count (%) |
|-------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Rhinorrhea                    | 55 (28.5) | 41 (38.0) | 10 (23.3) | 4 (15.4)  | 0         |
| Fatigue                       | 30 (15.5) | 15 (13.9) | 7 (16.3)  | 8 (30.8)  | 0         |
| Myalgia/body aches            | 69 (35.8) | 32 (29.6) | 20 (46.5) | 12 (46.2) | 5 (83.5)  |
| Headache                      | 25 (13.0) | 18 (16.3) | 4 (9.3)   | 0         | 1 (16.7)  |
| Diarrhea                      | 15 (7.8)  | 9 (8.3)   | 1 (2.3)   | 1 (3.8)   | 1 (16.7)  |
| Poor appetite                  | 4 (2.1)   | 1 (0.9)   | 1 (2.3)   | 2 (7.7)   | 0         |
| Nausea or vomiting            | 5 (2.6)   | 1 (0.9)   | 1 (2.3)   | 3 (11.5)  | 0         |
| Decrease of taste             | 8 (4.1)   | 3 (2.8)   | 1 (2.3)   | 4 (15.4)  | 0         |
| Decrease of smell             | 11 (5.7)  | 7 (6.5)   | 1 (2.3)   | 3 (11.5)  | 0         |
| No any symptom                | 13 (6.7)  | 10 (100)  | 3 (2.8)   | 0         | 0         |

Vital signs at the first presentation, initial laboratory and radiographic findings

| Body temperature, °C, mean (±SD) | 37.3 (0.8) | 36.6 (0.3) | 37.0 (0.6) | 37.5 (1.0) | 37.8 (1.1) | 38.0 (0.8) |
|----------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Distribution of temperature (n=191), no (%) |           |           |           |           |           |           |
| <37.3°C                          | 115 (60.2)| 10 (100)  | 77 (72.8) | 19 (44.2) | 9 (34.6)  | 0         |
| 37.3-38.0°C                      | 46 (24.1) | 0         | 24 (22.6) | 12 (27.9) | 6 (22.3)  | 4 (66.7)  |
| 38.1-39.0°C                      | 20 (10.5) | 0         | 4 (3.8)   | 9 (20.9)  | 6 (22.3)  | 1 (16.7)  |
| >39.0°C                          | 10 (5.2)  | 0         | 1 (0.9)   | 3 (7.0)   | 5 (19.2)  | 1 (16.7)  |
| Respiratory rate, breath/min, median (IQR) | 18 (18-20) | 18 (18-19) | 18 (18-19) | 18 (18-19) | 20 (18-22) | 20 (19-28) |
| Oxygen saturation at presentation, %, median (IQR) | 98 (97-99) | 99 (98-99) | 99.0 (98-100) | 98 (97-99) | 97 (95-98) | 96 (88-98) |
| Initial laboratory findings, median (IQR) |                   |                   |                   |                   |                   |                   |
| White blood cell count, x10^9/L  | 5.9 (4.6-7.1)| 6.8 (5.8-7.7)| 5.9 (4.7-7.3)| 5.3 (4.1-6.2)| 6.2 (5.4-8.0)| 6.9 (4.8-8.4) |
| Absolute neutrophil count, x10^9/L | 3.5 (2.6-4.9)| 3.6 (2.7-5.1)| 3.5 (2.7-4.8)| 3.0 (2.2-4.0)| 4.7 (3.2-6.3)| 5.8 (4.1-6.5) |
| Absolute lymphocyte count, x10^9/L | 1.6 (1.1-2.1)| 2.0 (1.4-2.3)| 1.8 (1.3-2.2)| 1.4 (1.1-1.9)| 1.3 (0.9-1.5)| 0.8 (0.5-0.9) |
| Absolute monocyte count, x10^9/L  | 0.3 (0.2-0.5)| 0.5 (0.3-0.5)| 0.4 (0.2-0.5)| 0.3 (0.2-0.5)| 0.3 (0.2-0.4)| 0.3 (0.2-0.4) |
| Hemoglobin, x10^12/L             | 13.6 (12.6-14.6)| 13.5 (12.2-13.7)| 13.3 (12.5-14.2)| 13.9 (12.9-14.9)| 14.1 (12.3-15.0)| 13.6 (12.1-14.3)|
|                          | 221 (181-280) | 243 (207-276) | 240 (195-300) | 199 (164-226) | 204 (156-260) | 165 (162-188) |
|--------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Sodium level (n=96), mEq/L | 139 (137-141) | 141 (139-143) | 140 (139-141) | 139 (137-141) | 137 (133-139) | 136 (133-141) |
| Potassium level (n=96), mEq/L | 3.9 (3.6-4.2) | 3.8 (2.9-3.9) | 4.1 (3.9-4.3) | 3.9 (3.6-4.1) | 3.6 (3.4-4.3) | 3.8 (3.2-4.0) |
| Chlorine level (n=96), mEq/L | 102 (99-103) | 102 (99-103) | 102 (101-104) | 102 (100-103) | 98 (95-102) | 102 (96-103) |
| Bicarbonate level (n=96), mEq/L | 24 (23-25) | 25 (23-27) | 24 (22-25) | 24 (23-25) | 24 (21-25) | 23 (18-26) |
| Creatinine (n=112), mg/dL | 0.8 (0.7-1.0) | 0.8 (0.6-0.9) | 0.7 (0.6-0.9) | 0.9 (0.7-1.0) | 0.8 (0.7-1.1) | 1.1 (1.0-1.3) |
| Aspartate aminotransferase (n=104), U/L | 24 (19-35) | 21 (18-31) | 21 (17-25) | 28 (22-41) | 33 (23-39) | 78 (52-85) |
| Alanine aminotransferase (n=104), U/L | 22 (15-33) | 22 (16-23) | 18 (12-25) | 27 (20-41) | 21 (14-38) | 48 (41-64) |
| Rapid influenza diagnosis test, n (%) | | | | | | |
| - Negative | 140 (72.5) | 6 (60.0) | 74 (68.5) | 37 (86.0) | 19 (73.1) | 4 (66.7) |
| - Positive | 1 (0.5) | 0 | 1 (0.9) | 0 | 0 | 0 |
| - Not done | 52 (26.9) | 4 (60.0) | 33 (30.6) | 6 (14.0) | 7 (26.9) | 2 (33.3) |
| Initial chest film opacities, n (%) | | | | | | |
| None | 156 (80.8) | 10 (100) | 108 (100) | 22 (51.2) | 12 (46.2) | 4 (66.7) |
| Unilateral | 17 (8.8) | 0 | 0 | 13 (30.2) | 4 (15.4) | 0 |
| Bilateral | 20 (10.4) | 0 | 0 | 8 (18.6) | 10 (38.5) | 2 (33.3) |

* More than one pre-existing condition or presenting symptoms could be given for these characteristics
Table 2. Treatments and clinical course during hospitalization

| Treatments                                                                 | All (n=193) | Asymptomatic (n=10) | Mild (n=108) | Moderate (n=43) | Severe (n=26) | Critical (n=6) |
|----------------------------------------------------------------------------|-------------|---------------------|-------------|----------------|--------------|---------------|
| Supportive, no (%)                                                         | 74 (38.3)   | 9 (90.0)            | 53 (49.1)   | 10 (23.3)      | 2 (7.7)      | 0             |
| Chloroquine monotherapy, no (%)                                           | 20 (10.4)   | 0                   | 20 (18.5)   | 0              | 0            | 0             |
| Chloroquine or Hydroxychloroquine + Boosted Lopinavir or Darunavir, no (%) | 36 (18.7)   | 1 (10.0)            | 28 (25.9)   | 1 (2.3)        | 4 (15.4)     | 2 (33.3)      |
| Hydroxychloroquine + azithromycin, no (%)                                  | 8 (4.1)     | 0                   | 7 (6.5)     | 1 (2.3)        | 0            | 0             |
| Chloroquine or Hydroxychloroquine + Boosted Lopinavir or Darunavir + azithromycin, no (%) | 5 (2.6)     | 0                   | 0           | 1 (2.3)        | 3 (11.5)     | 1 (16.7)      |
| Chloroquine or Hydroxychloroquine + Boosted Lopinavir or Darunavir + Favipiravir, no (%) | 38 (19.7)   | 0                   | 27 (62.8)   | 10 (38.5)      | 1 (16.7)     |               |
| Chloroquine or Hydroxychloroquine + Boosted Lopinavir or Darunavir + azithromycin + Favipiravir, no (%) | 12 (6.2)    | 0                   | 3 (7.0)     | 7 (26.9)       | 2 (33.3)     |               |
| Remdesivir, no (%)                                                         | 7 (3.6)     | 0                   | 0           | 0              | 5 (19.2)     | 2 (33.3)      |
| Tocilizumab, no (%)                                                        | 3 (1.6)     | 0                   | 0           | 0              | 2 (8.0)      | 1 (16.7)      |
| Glucocorticoid, no (%)                                                     | 2 (1.0)     | 0                   | 0           | 0              | 0            | 2 (33.3)      |
| Convalescent plasma, no (%)                                                | 2 (1.0)     | 0                   | 0           | 0              | 0            | 2 (33.3)      |
| Antibiotics, no (%)                                                        | 27 (14.0)   | 0                   | 3 (2.8)     | 7 (16.3)       | 12 (46.2)    | 5 (83.3)      |
| Oxygen therapy, no (%)                                                     |             |                     |             |                |              |               |
| - Nasal cannula/face mask                                                  | 36 (18.7)   | 0                   | 4 (9.3)     | 26 (100)       | 6 (100)      |               |
| - High-flow oxygen                                                         | 9 (4.7)     | 0                   | 0           | 5 (19.2)       | 4 (66.7)     |               |
| - Invasive ventilation                                                     | 5 (2.6)     | 0                   | 0           | 0              | 5 (83.3)     |               |
| Days of oxygen therapy, median (IQR)                                       | 5.0 (2.5-11.0) | -                | 2.0 (1.3-2.8) | 5.5 (3.0-11.0) | >18.0         |               |
| Extracorporeal membrane oxygenation (ECMO), no (%)                         | 0           | 0                   | 0           | 0              | 0            | 1 (16.7)      |
### Continuous Renal Replacement Therapies (CRRT), no (%)

| Continuous Renal Replacement Therapies (CRRT), no (%) | 0 | 0 | 0 | 0 | 1 (16.7) |

### Complications and hospital outcomes

| Days from onset of illness to admission, median (IQR) | 5.0 (3.0-7.0) | - | 5.0 (3.0-7.0) | 5.0 (3.0-9.0) | 5.5 (4.0-9.0) | 5.5 (2.8-7.0) |
|-----------------------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|

| Fever during hospitalization, n (%) | 95 (49.2) | 0 | 29 (26.9) | 35 (81.4) | 25 (96.2) | 6 (100) |
|-------------------------------------|-----------|----------------|----------------|----------------|----------------|----------------|

| Highest temperature during hospitalization, °C, mean (±SD) | 38.5 (0.8) | < 37.3 | 37.9 (0.5) | 38.5 (0.6) | 39.0 (0.8) | 39.5 (0.9) |
|----------------------------------------------------------|-----------|----------------|----------------|----------------|----------------|----------------|

| - Days to defervescence after admission, days, median (IQR) | 5.0 (3.0-9.0) | - | 3.0 (1.0-5.5) | 6.0 (3.0-9.0) | 7.0 (5.0-11.5) | 15.0 (NA) |
|-------------------------------------------------------------|-----------|----------------|----------------|----------------|----------------|----------------|

| Worst opacity in chest film, n (%) | None | 118 (61.1) | 10 (100) | 108 (100) | 0 | 0 |
|-----------------------------------|--------|-------------|----------|-----------|----|----|

| Unilateral | 26 (13.5) | 0 | 0 | 24 (55.8) | 2 (7.7) | 0 |
|-------------|-----------|----------------|----------------|----------------|----------------|----------------|

| Bilateral | 49 (25.4) | 0 | 0 | 19 (44.2) | 24 (92.3) | 6 (100) |
|------------|-----------|----------------|----------------|----------------|----------------|----------------|

| Oxygen saturation < 95%, n (%) | 35 (18.1) | 0 | 0 | 3 (7.0) | 26 (100) | 6 (100) |
|-------------------------------|-----------|----------------|----------------|----------------|----------------|----------------|

| Respiratory rate ≥ 24 breaths/min, n (%) | 25 (13.0) | 0 | 0 | 2 (4.7) | 17 (65.4) | 6 (100) |
|------------------------------------------|-----------|----------------|----------------|----------------|----------------|----------------|

| ICU admission, n (%) | 32 (16.6) | 0 | 0 | 6 (14.0) | 20 (76.9) | 6 (100) |
|----------------------|-----------|----------------|----------------|----------------|----------------|----------------|

| ARDS, n (%) | 6 (3.1) | 0 | 0 | 0 | 0 | 6 (100) |
|-------------|---------|----------------|----------------|----------------|----------------|----------------|

| Acute kidney injury, n (%) | 7 (3.6) | 0 | 0 | 2 (4.7) | 0 | 5 (83.3) |
|---------------------------|---------|----------------|----------------|----------------|----------------|----------------|

| Co-infection*, n (%) | 8 (4.1) | 0 | 3 (2.8) | 2 (4.7) | 1 (3.7) | 2 (33.3) |
|----------------------|---------|----------------|----------------|----------------|----------------|----------------|

| Days of hospitalization, median (IQR) | 12.0 (7.5-19.0) | 8.5 (5.8-20.8) | 10.5 (7.0-16.0) | 13.0 (9.0-18.0) | 16.0 (12.0-22.3) | 32.5 (19.3-51.2) |
|---------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|

| Days of viral RNA shedding after onset of illness, median (IQR) | 16.0 (11.0-24.0) | 6.0 (4.8-19.0) | 13.0 (9.0-21.0) | 16.0 (12.0-24.0) | 20.5 (13.0-24.0) | 26.5 (21.5-34.5) |
|------------------------------------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|

### Final outcome, n (%)

| - Recovered | 189 (97.9) | 10 (100) | 108 (100) | 43 (100) | 26 (100) | 2 (33.3) |
|-------------|-----------|---------|----------|--------|--------|--------|

| - Died | 4 (2.1) | 0 | 0 | 0 | 0 | 4 (66.7) |
|--------|--------|----------------|----------------|----------------|----------------|----------------|

| - Remained hospitalized, n (%) | 0 | 0 | 0 | 0 | 0 | 0 |
|--------------------------------|----|----|----|----|----|----|

* Pulmonary tuberculosis in 2, H. influenzae in 2, Influenza A in 1, adenovirus in 1, H. parainfluenzae in 1, K. pneumoniae in 1
Table 3. Baseline characteristics and initial laboratory findings compared 193 COVID-10 patients with vs without pneumonia

|                                | Non-pneumonia (n=118) | Pneumonia (n=75) | p-value |
|--------------------------------|------------------------|------------------|---------|
| Age, years, median (IQR)       | 33.0 (26.0-42.3)       | 51.0 (38.0-59.0) | <0.001  |
| Sex, no (%)                    |                        |                  | 0.001   |
| - Male                         | 58 (49.2)              | 55 (73.3)        |         |
| - Female                       | 60 (50.8)              | 20 (26.7)        |         |
| Body Mass Index (BMI), kg/m², median (IQR) | 21.8 (19.4-24.7)       | 25.1 (22.8-29.9) | <0.001  |
| - Obesity (BMI ≥30), no (%)    | 6 (5.1)                | 16 (21.3)        | 0.001   |
| Nationality, no (%)            |                        |                  | 0.934   |
| - Thai                         | 108 (91.5)             | 68 (90.7)        |         |
| - Non-Thai                     | 10 (8.5)               | 7 (9.3)          |         |
| Type of infection, no (%)      |                        |                  | 0.853   |
| - Imported cases               | 24 (20.3)              | 16 (21.3)        |         |
| - Local transmission cases     | 94 (79.7)              | 59 (78.7)        |         |
| Transmission link, no (%)      |                        |                  | 0.007   |
| - Contact with confirmed cases | 51 (43.2)              | 16 (21.3)        |         |
| - Travel history within 14 days before onset of symptom | 24 (20.3) | 16 (21.3) |
| - Attended or worked at crowded places | 21 (17.8) | 12 (16.0) |
| - Boxing stadium clusters      | 18 (15.3)              | 26 (34.7)        |         |
| - Healthcare facility          | 0                      | 1 (1.3)          |         |
| - Unknown                      | 4 (3.8)                | 4 (6.3)          | 1.000   |
| Smoking (n=157), no (%)        |                        |                  | 0.310   |
| - Ever                         | 17 (18.7)              | 12 (18.2)        |         |
| Alcohol drinking (n=164), no (%) |                      |                  |         |
| - Yes                          | 33 (35.5)              | 19 (26.6)        |         |
| Coexisting conditions, no (%)  |                        |                  |         |
| - Any                          | 13 (11.0)              | 35 (46.7)        | <0.001  |
| - Diabetes                     | 4 (3.4)                | 12 (16.0)        | 0.003   |
| - Hypertension                 | 7 (5.9)                | 24 (32.0)        | <0.001  |
| - Dyslipidemia                 | 3 (2.5)                | 7 (9.3)          | 0.050   |
| - Allergy                      | 1 (0.8)                | 1 (1.3)          | 1.000   |
| Condition                                    | Present (n, %) | Reference (n, %) | p-value |
|----------------------------------------------|----------------|------------------|---------|
| Chronic pulmonary diseases                   | 1 (0.8)        | 2 (2.7)          | 0.561   |
| Chronic heart diseases                       | 0              | 2 (2.7)          | 0.150   |
| Chronic liver diseases                       | 1 (0.8)        | 4 (5.3)          | 0.076   |
| HIV infection                                | 1 (0.8)        | 1 (1.3)          | 1.000   |
| Angiotensin-converting enzyme inhibitors use, no (%) | 3 (2.5)        | 3 (4.0)          | 0.679   |
| Angiotensin-receptor blockers use, no (%)    | 3 (2.5)        | 8 (10.7)         | 0.025   |
| Presenting symptoms, no (%)                  |                |                  |         |
| Fever                                        | 60 (50.8)      | 61 (81.3)        | <0.001  |
| Dry cough                                    | 50 (42.4)      | 45 (60.0)        | 0.019   |
| Productive cough                             | 22 (18.6)      | 19 (25.3)        | 0.283   |
| Shortness of breath                          | 6 (6.8)        | 17 (22.7)        | 0.002   |
| Sore throat                                  | 42 (35.6)      | 12 (16.0)        | 0.003   |
| Rhinorrhea                                   | 41 (34.7)      | 14 (18.7)        | 0.022   |
| Fatigue                                      | 15 (12.7)      | 15 (20.0)        | 0.221   |
| Myalgia/body aches                           | 32 (27.1)      | 37 (49.3)        | 0.002   |
| Headache                                     | 18 (15.3)      |                  | 0.276   |
| Diarrhea                                     | 9 (7.6)        | 6 (8.0)          | 1.000   |
| Poor appetite                                | 1 (0.8)        | 3 (4.0)          | 0.301   |
| Nausea or vomiting                           | 1 (0.8)        | 4 (5.3)          | 0.076   |
| Decrease of taste                            | 3 (2.5)        | 5 (6.7)          | 0.265   |
| Decrease of smell                            | 7 (5.9)        | 4 (5.3)          | 1.000   |
| No any symptom                               | 13 (11.0)      | 0                | 0.002   |
| Body temperature at presentation, °C, mean (±SD) | 37.0 (0.6)    | 37.6 (1.0)       | <0.001  |
| Respiratory rate at presentation, breath/min, median (IQR) | 18 (18-20)    | 20 (18-20)       | 0.001   |
| Oxygen saturation at presentation, %, median (IQR) | 99 (98-100)   | 98 (97-99)       | <0.001  |

Initial laboratory findings, median (IQR)

| Test                              | Present (n, %) | Reference (n, %) | p-value |
|-----------------------------------|----------------|------------------|---------|
| White blood cell count, x10⁹/L   | 5.9 (4.8-7.3)  | 5.8 (4.3-6.9)    | 0.298   |
| Absolute neutrophil count, x10⁹/L | 3.5 (2.7-4.8)  | 3.5 (2.6-5.2)    | 0.580   |
| Absolute lymphocyte count, x10⁹/L | 1.8 (1.3-2.2)  | 1.3 (0.9-1.7)    | <0.001  |
| Absolute monocyte count, x10⁹/L  | 0.4 (0.3-0.5)  | 0.3 (0.2-0.5)    | 0.413   |
| Hemoglobin, x10⁹/L               | 13.3 (12.6-14.0)| 14.0 (12.5-15.0) | 0.061   |
| Platelet count, x10⁹/L           | 240 (194-247)  | 194 (157-226)    | <0.001  |
| Sodium level (n=96), mEq/L       | 140 (139-141)  | 138 (136-140)    | 0.004   |
### Potassium level (n=96), mEq/L
|               | 4.0 (3.8-4.2) | 3.8 (3.5-4.1) | 0.005 |
### Chlorine level (n=96), level, mEq/L
|               | 102 (101-104) | 100 (97-103) | 0.005 |
### Bicarbonate level (n=96), mEq/L
|               | 24 (23-25)    | 24 (23-25)    | 0.435 |
### Creatinine (n=112), mg/dL
|               | 0.7 (0.8-0.9) | 0.9 (0.7-1.1) | <0.001 |
### Aspartate aminotransferase (n=104), U/L
|               | 21 (18-25)    | 31 (23-43)    | <0.001 |
### Alanine aminotransferase (n=104), U/L
|               | 19 (13-25)    | 26 (19-42)    | 0.001 |

**Outcomes**

| Outcome                                      | Number (%)       | Count          | p-value |
|----------------------------------------------|------------------|----------------|---------|
| Fever during hospitalization, n (%)          | 29 (24.6)        | 66 (88.0)      | <0.001  |
| Highest temperature during hospitalization, °C, mean (±SD) | 37.9 (0.5)        | 38.8 (0.8)     | <0.001  |
| Days to defervescence after admission, days, median (IQR) | 3.0 (1.0-5.5)    | 6.0 (4.0-10.0) | <0.001  |
| ICU admission n, (%)                         | 0                | 32 (42.7)      | <0.001  |
| Days of hospitalization, median (IQR)        | 10.0 (6.8-16.0)  | 14.0 (10-23.0) | <0.001  |
| Days of viral RNA shedding after onset of symptom, median (IQR) | 14.0 (10-24.0)  | 18.0 (13.0-24.0) | 0.023   |
| Final clinical outcomes                      |                  |                | 0.002   |
| Recovered, n (%)                             | 118 (100)        | 71 (94.7)      |         |
| Died, n (%)                                  | 0                | 4 (5.3)        |         |
Table 4. Logistic regression analyses of factors associated with COVID-19 pneumonia

| Factor                                         | Crude OR (95% CI) | p-value | Adjust OR (95% CI) | p-value |
|------------------------------------------------|-------------------|---------|-------------------|--------|
| Male sex (vs female)                           | 2.85 (1.52-5.32)  | 0.001   | 2.30 (0.79-6.69)  | 0.125  |
| Age, for every 10-year increase from 30 years old | 2.24 (1.73-2.90)  | <0.001  | 2.60 (1.68-3.97)  | <0.001 |
| Body Mass Index (BMI)                          | 1.20 (1.11-1.30)  | <0.001  |                   |        |
| - BMI < 30                                     |                   |         |                   |        |
| - BMI ≥ 30 (obesity)                           | 5.55 (2.05-15.06) | 0.001   | 9.17 (2.11-39.89) | 0.003  |
| Nationality                                    |                   |         |                   |        |
| - Non-Thai                                     |                   |         |                   |        |
| - Thai                                         | 1.26 (0.11-14.16) | 0.825   |                   |        |
| Type of infection                              |                   |         |                   |        |
| - Imported cases                               |                   |         |                   |        |
| - Local transmission cases                     | 0.94 (0.46-1.92)  | 0.868   |                   |        |
| Transmission link                              |                   |         |                   |        |
| - Contact with confirmed cases                 |                   |         |                   |        |
| - Travel history within 14 days before onset of symptom | 2.13 (0.91-4.95) | 0.081   |                   |        |
| - Attended or worked at crowded places          | 1.82 (0.74-4.50)  | 0.194   |                   |        |
| - Boxing stadium clusters                      | 4.60 (2.02-10.48) | <0.001  | 1.01 (0.31-3.31)  | 0.928  |
| - Unknown                                      | 3.19 (0.72-14.22) | 0.129   |                   |        |
| Smoking (vs never)                             | 0.98 (0.43-2.19)  | 0.937   |                   |        |
| Current alcohol drinking (vs no drinking)      | 0.66 (0.34-1.31)  | 0.235   |                   |        |
| Coexisting conditions                          |                   |         |                   |        |
| - Diabetes                                     | 5.43 (1.48-17.54) | 0.005   | 1.10 (0.21-5.85)  | 0.916  |
| - Hypertension                                 | 7.46 (3.02-18.44) | <0.001  | 1.29 (0.21-7.99)  | 0.788  |
| - Dyslipidemia                                 | 3.95 (0.98-15.77) | 0.052   |                   |        |
| - Allergy                                      | 1.58 (0.10-25.67) | 0.741   |                   |        |
| - Chronic pulmonary diseases                   | 3.21 (0.29-35.98) | 0.345   |                   |        |
| - Chronic liver diseases                       | 6.60 (0.72-60.15) | 0.095   |                   |        |
| - HIV infection                                | 1.58 (0.10-25.66) | 0.747   |                   |        |
| Angiotensin-converting enzyme inhibitors use   | 1.60 (0.31-8.13)  | 0.573   |                   |        |
| Angiotensin-receptor blockers use              | 4.58 (1.17-17.85) | 0.028   | 2.19 (0.17-27.70) | 0.544  |
| Test                                      | Value            | p-value | Value            | p-value |
|-------------------------------------------|------------------|---------|------------------|---------|
| Body temperature at presentation, per 1°C | 3.55 (2.23-5.64) | <0.001  | 4.66 (2.32-9.34) | <0.001  |
| Increased from 37.2 °C                    |                  |         |                  |         |
| White blood cell count                    | 0.93 (0.79-1.08) | 0.311   |                  |         |
| Absolute neutrophil count                | 1.06 (0.90-1.25) | 0.512   |                  |         |
| Absolute lymphocyte count                | 0.28 (0.16-0.48) | <0.001  |                  |         |
| Absolute lymphocyte < 1,500 per mm³      | 3.69 (2.00-6.82) | <0.001  | 1.65 (0.60-4.50) | 0.330   |
| Absolute monocyte count                   | 0.47 (0.09-2.48) | 0.376   |                  |         |
| Hemoglobin level                          | 1.19 (0.99-1.44) | 0.07    |                  |         |
| Platelet count                            | 0.98-9.99        | <0.001  |                  |         |
| Platelet count < 150 per mm³              | 9.84 (2.11-45.86) | 0.004   | 4.12 (0.55-31.12) | 0.169   |
Figure 1. Disease severity classification

- Asymptomatic: 5.2%
- Mild: 55.9%
- Moderate: 22.3%
- Severe: 13.5%
- Critical: 3.1%