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*Coronavirus Pandemic*

# Clinical Characteristics of Patients with Coronavirus Disease 2019 (COVID-19) in a Teaching Hospital in Malaysia

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## Abstract

Introduction: Information on the clinical characteristics of local patients with confirmed COVID-19 is limited. This study aims to report the clinical characteristics of 147 patients admitted and receiving treatment at a teaching hospital.

Methodology: Patients' socio-demographic and epidemiological data, clinical features, laboratory findings and clinical outcomes were extracted using a data sheet.

Results: The median patient age was 25 [interquartile range (IQR)] 20–44) years, and most of patients were male (68.7%) and of Malaysian nationality (88.4%). Almost half of the patients were from a case cluster related to a religious event (48.3%) and 12.9% had a history of overseas travel. A total of 33.3% of patients were not related to any case cluster, i.e. sporadic cases. Radiological investigation showed that 13.6% of the patients had chest X-ray changes and all laboratory parameters were within the normal ranges. Sixty-six patients (44.9%) experienced symptoms. The most common symptoms were rhinitis (66.7%), followed by fever (19.7%) and cough (15.2%). Age, gender, case cluster, comorbidity status, haemoglobin, albumin, total protein, bilirubin total and alkaline phosphatase level were associated with symptomatic status.

Conclusions: In this single-centre study, COVID-19 infection led not only to case clusters, but also to sporadic infections, with patients being either symptomatic or asymptomatic. These sporadic cases and asymptomatic patients may hamper effective contact tracing, leading to rapid human-to-human transmission in our population. Future studies on the prevalence and clinical significance of asymptomatic and presymptomatic COVID-19 patients would pre-emptively address issues on further containment of the pandemic.

**Key words:** COVID-19; teaching hospital; Malaysia.

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## Introduction

Malaysia reported its first confirmed case of coronavirus disease 2019 (COVID-19) on 25 January, 2020. In the early stage, the incidence of COVID-19–positive cases was low. However, the country has been enforcing the Movement Control Order since 18 March, 2020, to curb the exponential increase of cases. To control the pandemic, the Malaysia Ministry of Health (MOH) had promptly activated Crisis Preparedness and Response Centres (CPRC) at all levels and had designated COVID-19 screening and admitting hospitals across the country [1 ]. As of 24 April, 2020, Malaysia has recorded 5,691 confirmed COVID-19 cases, with 96 deaths (1.7%) [2]. Apart from MOH hospitals, non-MOH hospitals such as teaching hospitals have also been designated as COVID-19 screening and admitting hospitals [1]. Recent studies have shown that the infection may have a spectrum of clinical presentation from asymptomatic to severe disease requiring oxygen support and admission to the intensive care unit [3, 4]. To date, there are limited published studies on the characteristics of confirmed

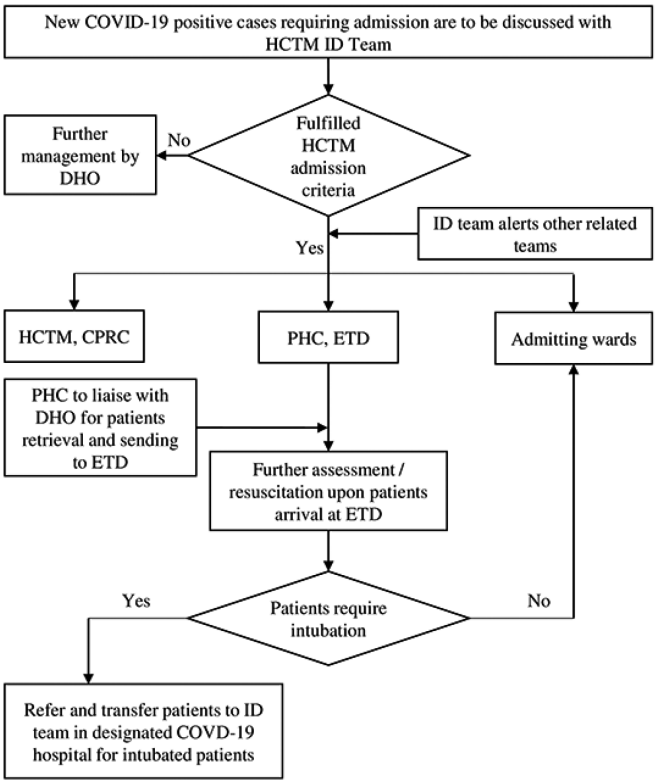
COVID-19 cases receiving treatment at a teaching hospital in Malaysia. The present study aims to describe the socio-demographic and epidemiological data, clinical features, laboratory findings and clinical outcomes of such patients. We also compare the clinical characteristics between symptomatic and asymptomatic patients.

## Methodology

*Study background*

Hospital Canselor Tuanku Muhriz (HCTM), previously known as Universiti Kebangsaan Malaysia Medical Centre, is a teaching hospital in Cheras, and is approximately 15 km from Kuala Lumpur City Centre. It is a tertiary healthcare facility that caters to the healthcare needs of the surrounding population. In line with the government's efforts to fight the COVID-19 pandemic, HCTM was appointed on 30 March, 2020, as a COVID-19 screening and admitting hospital for confirmed patients at clinical stage 1–3. HCTM began to receive confirmed COVID-19 cases referred from the neighbouring district health offices (DHO) on 2 April, 2020. HCTM also admits confirmed COVID-19 cases diagnosed by private laboratories and screening private hospitals.

**Figure 1.** Brief workflow of patient admission to HCTM upon DHO referral.




HCTM: Hospital Canselor Tuanku Muhriz; CPRC: Crisis Preparedness Response Centre; ID: Infectious Disease; DHO: District Health Office; PHC: Pre-Hospital Care; ETD: Emergency and Trauma Department.

*Study design and patients*

This case series involved 147 confirmed COVID-19 cases who had been admitted and received treatment at HCTM until 22 April, 2020. All patients included in the study were diagnosed according to World Health Organization interim guidance [5] and MOH Malaysia COVID-19 Management Guidelines [1]. The inclusion criteria were patients admitted and treated as laboratory-confirmed cases with clinical stage 1–3 disease [1]. We excluded patients who deteriorated to clinical stage 4 and 5 (either transferred to other hospitals or not) or who died. Figure 1 depicts a brief workflow of patient admission to HCTM upon DHO referral. The Universiti Kebangsaan Malaysia Medical Research Ethic Committee approved this study (Project code: FF-2020-256).

*Data collection*

The data were extracted using a data sheet. The socio-demographic data (age, gender, nationality) and epidemiological data (duration from the date of first positive swab to admission, duration of hospital stay and epidemiological link) of confirmed COVID-19 cases, which are obtained by the Case Tracing Team, were retrieved from the HCTM CPRC database. Clinical data (comorbidity, symptoms on admission, vital signs, and laboratory findings) were retrieved from the patients' medical records and the online medical system. In addition, two researchers reviewed the data collection forms independently to double-check the retrieved data.

*Definition*

A confirmed COVID-19 case is defined as 'a person with laboratory confirmation of infection with the COVID-19 [1]. Each patient admitted was categorized according to clinical staging criteria adopted from a national guideline [1]. The operational definitions for clinical severity are as follows: Stage 1: asymptomatic; Stage 2: mild respiratory symptoms without evidence of pneumonia; Stage 3: respiratory symptoms with evidence of pneumonia (either clinically or radiologically) but not requiring supplemental oxygen; Stage 4: respiratory symptoms with evidence of pneumonia (either clinically or radiologically) requiring supplemental oxygen; and Stage 5: critically ill with multi-organ involvement.

The Modified Early Warning Score which has been widely adopted to identify patient's condition is also

used in HCTM [6-8]. Modified Early Warning Score enables early detection of deteriorating patients who require prompt intervention. The discharge criteria for such patients are resolution of clinical signs and symptoms with at least one negative nasopharyngeal swab and oropharyngeal swab (NPO-RT PCR) for COVID-19 by polymerase chain reaction at day 13 of illness. Similar criterion was applied for the asymptomatic patients. Following discharge from hospital, the patient is subject to a minimum 7-day self-quarantine either at home or at a designated quarantine centre.

*Statistical analysis*

The data were analysed using SPSS (v.20). Categorical data are presented as frequency (*n*) and percentages (%), and continuous data are expressed as the mean and SD if the data were normally distributed, or as the median and interquartile range (IQR) values. Further analyses were conducted using the Pearson chi-square and Fisher exact tests for categorical data. The Student's *t* and Mann-Whitney tests were used for continuous data, based on data distribution. Statistical significance was set at $p < 0.05$.

## Results

*Characteristics of patients with confirmed COVID-19*

This study included 147 hospitalized patients with confirmed COVID-19. Of this, the discharge rate was 49.7% with zero death recorded. The median patient age was 25 (IQR 20–44) years; one-third of the patients were in the 20–29-year age group (38.8%). Most patients were male (68.7%) and of Malaysian nationality (88.4%). The median duration from first positive swab to admission and median hospital stay was 3 (IQR 1–10) and 10days (IQR4–19) days, respectively. Almost half of the patients had epidemiological links to a case cluster related to a religious event (48.3%), and 12.9% had a history of overseas travel. A total of 33.3% of patients were not linked to any case cluster, i.e. sporadic cases (Table 1).

**Table 1.** Socio-demographic and epidemiological characteristics of confirmed COVID-19 patients.

| Factors | Total | Presence of symptom | | Statistical test | *p* value |
|---|---|---|---|---|---|
| | | Yes | No | | |
| **Socio-demographic** | | | | | |
| **Age, years [median (IQR)]** | **25 (20-44)** | | | | |
| | *n* (%) | *n* (%) | *n* (%) | | |
| 10-19 | 28 (19) | 15 (22.7) | 13 (16) | 28.83[a] | **< 0.001** |
| 20-29 | 57 (38.8) | 38 (57.6) | 19 (23.5) | | |
| 30-39 | 19 (12.9) | 4 (6.1) | 15 (18.5) | | |
| 40-49 | 17 (11.6) | 6 (9.1) | 11 (13.6) | | |
| 50-59 | 10 (6.8) | 2 (3) | 8 (9.9) | | |
| 60-69 | 12 (8.2) | 1 (1.5) | 11 (13.6) | | |
| ≥80 | 4 (2.7) | 0 | 4 (4.9) | | |
| **Gender** | | | | **11.92[b]** | **0.001** |
| Male | 101 (68.7) | 55 (83.3) | 46 (56.8) | | |
| Female | 46 (31.3) | 11 (16.7) | 35 (43.2) | | |
| **Nationality** | | | | **0.72[b]** | **0.447** |
| Malaysian | 130 (88.4) | 60 (90.9) | 70 (86.4) | | |
| Non-Malaysian | 17 (11.6) | 6 (9.1) | 11 (13.6) | | |
| **Epidemiological data** | | | | | |
| **Current status** | | | | | |
| Discharged | 73 (49.7) | | | | |
| In ward | 74 (50.3) | | | | |
| **Case-cluster** | | | | **32.50[b]** | **< 0.001** |
| Religious event | 71 (48.3) | 49 (74.2) | 22 (27.2) | | |
| Travel history | 19 (12.9) | 5 (7.6) | 14 (17.3) | | |
| Residential area | 8 (5.4) | 2 (3) | 6 (7.4) | | |
| Non-cluster | 49 (33.3) | 10 (15.2) | 39 (48.1) | | |
| | mean (SD) | mean (SD) | mean (SD) | | |
| Duration of first positive swab to admission, day [median (IQR)] | 3 (1-10) | | | | |
| Duration of stay, day [median (IQR)] | 10 (4-19) | | | | |

[a]: Fisher's Exact test; [b]: Pearson chi-square.

Table 2 shows the patients' clinical characteristics, and laboratory and radiological findings. Of the total study population, 15% of the patients had comorbidity. Radiological investigation showed that 13.6% of the patients had chest X-ray changes and all laboratory parameters were within the normal ranges. There were bilateral lung changes in 5% of patients, and 8.6% of patients had unilateral lung changes, while the majority (86.3%) had no lung changes.

*Symptomatic confirmed COVID-19 patients*

Sixty-six patients (44.9%) experienced symptoms (Table 3). The most common symptoms were rhinitis (66.7%), followed by fever (19.7%) and cough (15.2%). Further analysis indicated that age, gender, case cluster,

**Table 2.** Clinical characteristics and investigation findings of confirmed COVID-19 patients.

| Factors | Normal range | Total | Presence of symptom | | Statistical test | *p* value |
|---|---|---|---|---|---|---|
| | | | Yes | No | | |
| **Clinical characteristics** | | *n* (%) | *n* (%) | *n* (%) | | |
| Comorbid (*n* = 147) | | | | | 5.14[b] | **0.023** |
| Yes | | 22 (15) | 5 (7.6) | 17 (21) | | |
| No | | 125 (85) | 61 (92.4) | 64 (79) | | |
| | | mean (SD) | mean (SD) | mean (SD) | | |
| Systolic blood pressure, mmHg (*n* = 142) | | 127.62 (18.44) | 127.68 (13.66) | 129.18 (16.12) | - 0.59[c] | 0.558 |
| Diastolic blood pressure, mmHg (*n* = 142) | | 78.46 (11.60) | 78.37 (11.03) | 78.54 (12.11) | -0.09[c] | 0.928 |
| Pulse rate, beats/min (*n* = 139) | | 84.84 (12.97) | 83.48 (12.91) | 86.12 (12.98) | - 1.19[c] | 0.235 |
| **Lab/radiological findings** | | | | | | |
| White blood cell count, ×10^9/L (*n* = 146) | (4.0 -10.0) | 8.04 (2.11) | 8.32 (2.36) | 7.81 (1.87) | 1.45[c] | 0.149 |
| Hemoglobin, g/dL) (*n* = 146) | (12.0 -15.0) | 14.34 (2.05) | 15.15 (1.18) | 13.69 (2.35) | 4.58[c] | **< 0.001** |
| Platelet count, ×10^9/L (*n* = 146) | (150 - 410) | 290.95 (73.70) | 290.55 (77.44) | 291.26 (71.05) | -0.06[c] | 0.954 |
| Neutrophil count, ×10^9/L (*n* = 145) | (2.0 - 7.0) | 4.83 (1.80) | 4.99 (2.00) | 4.70 (1.62) | 0.97[c] | 0.335 |
| Lymphocyte count, ×10^9/L (*n* = 146) | (1.0 - 3.0) | 2.38 (9,81) | 2.51 (0.790 | 2.28 (0.81) | 1.71[c] | 0.091 |
| Monocyte count, ×10^9/L (*n* = 146) | (0.2 -1.0) | 0.64 (0.66) | 0.71 (0.97) | 0.59 (0.16) | 1.11[c] | 0.266 |
| Natrium, mmol/L (*n* = 146) | (136 - 145) | 139.46 (2.19) | 139.39 (1.88) | 139.52 (2.42) | -0.37[c] | 0.715 |
| Potassium, mmol/L (*n* = 146) | (3.5 - 5.1) | 4.10 (0.46) | 4.14 (0.49) | 4.08 (0.43) | 0.75[c] | 0.452 |
| Urea, mmol/L (*n* = 146) | (2.5 - 6.7) | 3.63 (1.41) | 3.52 (0.83) | 3.72 (1.74) | -0.85[c] | 0.397 |
| Creatinine, µmol/L (*n* = 146) | (50.4 - 98.1) | 78.81 (17.05) | 79.97 (12.30) | 77.89 (20.11) | 0.73[c] | 0.466 |
| Albumin, g/l (*n* = 146) | (35 - 50) | 43.49 (4.83) | 44.48 (3.36) | 42.69 (5.65) | 2.25[c] | **0.026** |
| Total Protein, g/l (*n* = 146) | (64 - 83) | 76.81 (8.02) | 79.26 (5.09) | 74.84 (9.33) | 3.43[c] | **0.001** |
| Bilirubin total, µmol/l (*n*=146) | (3.4 - 20.5) | 12.12 (6.11) | 13.46 (7.38) | 11.04 (4.65) | 2.41[c] | **0.017** |
| Alanine transaminase, U/L (*n*=146) | (0 - 55) | 31.07 (26.68) | 31.15 (22.12) | 31.00 (29.98) | 0.04[c] | 0.973 |
| Alkaline phosphatase, U/L (*n* = 144) | (40 - 150) | 86.71 (35.65) | 95.08 (40.10) | 80.01 (30.27) | 2.57[c] | **0.011** |
| Lactate dehydrogenase, U/L (*n* = 143) | (125 - 220) | 228.65 973.27) | 235.67 (78.75) | 222.96 (68.49) | 1.03[c] | 0.304 |
| | | *n* (%) | *n* (%) | *n* (%) | | |
| **CXR findings (*n* = 139)** | | | | | 2.46[a] | 0.515 |
| Small opacities | | 5 (3.6) | 3 (4.9) | 2 (2.6) | | |
| Ground glass opacity | | 11 (7.9) | 3 (4.9) | 8 (10.3) | | |
| Consolidation | | 3 (2.2) | 2 (3.3) | 1 (1.3) | | |
| No changes | | 120 (86.3) | 53 (86.9) | 67 (85.9) | | |
| **CXR: bilateral involvement (*n*=139)** | | | | | 1.07[a] | 0.602 |
| Yes | | 7 (5) | 4 (6.6) | 3 (3.8) | | |
| No | | 12 (8.6) | 4 (6.6) | 8 (10.3) | | |
| No changes | | 120 (86.3) | 53 (89.9) | 67 (85.9) | | |
| C-reactive protein, mg/dl (*n*=111) [median (IQR)] | < 0.5 | 0.17 (0.07-0.34) | 0.22 (0.08-0.44) | 0.15 (0.07-0.31) | -1.31[d] | 0.191 |

[a]: Fisher's Exact test; [b]: Pearson chi-square; [c]: Student's *t* test; [d]: Mann Whitney test; CXR: chest x-ray; *comorbid: hypertension, diabetes mellitus, bronchial asthma, dyslipidaemia, hypothyroidism, obesity.

comorbidity status, haemoglobin, albumin, total protein, bilirubin total and alkaline phosphatase level were associated with symptomatic status. There was a high proportion of symptomatic patients in the 10–19 (22.7%), 20–29 (57.6%) and 30–39 (21.1%) year age groups. Most of the symptomatic patients were male (83.3%). The highest proportion of symptomatic patients was linked to a religious event–related case cluster (74.2%). A total of 7.6% and 3% of symptomatic patients were from case clusters related to overseas travel history and residential area, respectively; 15.2% of symptomatic patients were not related to any case cluster. A total of 7.6% (5/61) of the symptomatic patients had comorbidity (2 patient with hypertension, 2 patients with diabetes mellitus, and 1 patients with asthma). Notably, the symptomatic patients had significantly higher laboratory parameters (haemoglobin, albumin, total protein, bilirubin total, alkaline phosphatase) compared to the asymptomatic patients, despite the parameters being within the normal ranges.

**Table 3.** Symptoms among the patients with confirmed COVID-19 ($n$ = 66).

| Symptoms | Yes | No |
|---|---|---|
| Fever | 13 (19.7) | 53 (80.3) |
| Cough | 10 (15.2) | 56 (84.8) |
| Shortness of breath | 3 (4.5) | 63 (95.5) |
| Sore throat | 7 (10.6) | 59 (89.4) |
| Rhinitis | 44 (66.7) | 22 (33.3) |
| Headache | 2 (3) | 64 (97) |
| Myalgia | 2 (3) | 64 (97) |
| Diarrhoea | 1 (1.5) | 65 (98.5) |

## Discussion

*Characteristics of patients with confirmed COVID-19*

HCTM has been a COVID-19 screening and admitting hospital since 30 March, 2020. As of 22 April, 2020, 147 patients had been admitted, half of whom have since been discharged from the hospital. The median age of our patients was slightly lower than that of hospitalized patients elsewhere, i.e. 49–56 years old [3, 4, 9]. This could be the result of large proportion of youth in the religious event–related case cluster patients, which dominated our present study population. Our patients were mainly male, which is also true of the patients admitted to Jin Yintan Hospital, Wuhan, China, by 2 January, 2020 [9] and Zhongnan Hospital of Wuhan University (1–28 January, 2020) [3]. The male predominance in our study population could also be due to, commonly big gathering of religious events were attended by them.

The second wave of major COVID-19 transmission occurred in early March 2020, significantly escalated the number of cases in Malaysia. It was linked to a religious event–related case cluster, as shown by the number of patients from this cluster admitted to HCTM. In Malaysia, the first-term school holidays fell on 13–30 March, 2020, which led to some of the population going on holiday abroad, giving rise to the overseas travel history–related case cluster. Almost one-third of our patients were not related to any case cluster. These sporadic cases cannot be traced to any clear source of infection conclusively, which hampers effective contact tracing. This is possibly due to the occurrence of rapid human-to-human transmission in our population, as a previous report has indicated that the basic reproductive number ($R_0$) for COVID-19 is 2.2 [10]. For our discharged patients, the median hospital stay was 10 (IQR 4–19) days, which was similar to patients admitted to Zhongnan Hospital of Wuhan University (1–28 January, 2020) was 10 (IQR 7-14) days [3]. Here, once diagnosis was suspected, it was confirmed using nasopharyngeal swab and oropharyngeal swab for COVID-19 by polymerase chain reaction. The median duration from the first positive test to admission was 3 (IQR 1–10) days. This could indicate the exhaustive capacity of the COVID-19–involved laboratories in the early phase of the second wave of the disease. The national capacity of the COVID-19–involved laboratories, has been greatly expanded recently in which HCTM has since become a key player in aiding MOH Malaysia in COVID-19 laboratory testing. Almost one-fifth of our overall study population has comorbidities, and 11.3% of non-critical patients admitted to Fangcang Hospital (7–12 February, 2020) [4] had comorbidities such as diabetes mellitus and hypertension. As patients admitted to our setting were generally at clinical stage 1-3 with low Modified Early Warning Score, they were relatively stable. This could explained why the vital signs and laboratory parameters of our patients were within the normal ranges. Radiological changes such as small opacities, ground-glass opacity and consolidation, as seen in hospitalized patients elsewhere, [4, 9] were also observed in some of our patients.

*Symptomatic confirmed COVID-19 patients*

Nearly half of our patients were symptomatic on admission. In comparison, a study in which non-critical patients were also hospitalized reported that 97% of the patients were symptomatic on admission [4]. Our symptomatic patients had commonly reported

symptoms as patients hospitalized elsewhere, [3,4,9] such as fever, cough, runny nose and sore throat. Notably, the most common symptom was rhinitis, in contrast with findings from a meta-analysis which reported rhinorrhoea (pooled prevalence: 9.2%, 95% CI 5.6, 12.8%) were the least common symptoms and the most frequent symptoms were fever (pooled prevalence: 72.4%, 95% CI 67.2, 77.7%) and cough (pooled prevalence: 55.5%, 95% CI 50.7, 60.3%) [11]. This could be due to our study population involved patients with clinical severity Stage 1-3 as compared to studies included in the meta-analysis. Furthermore, it being reported by most of the patients from the religious event–related case cluster. As mentioned earlier, this case cluster represents almost half of our study population.

It is worth noting that half of our patients were asymptomatic, and potentially infectious, as approximately one-fifth of them had chest x-ray changes. Asymptomatic transmission has also been reported from a familial cluster either with [11] or without [12] radiological changes. Despite the low incidence of diarrhoea in our symptomatic patients, others have reported this atypical symptom [3, 4]. Here, we show that some factors were significantly associated with symptomatic patients; other have also reported that some factors were related to different disease severity. Wang et al. reported that male sex and advance age were associated with developing severe disease or clinical deterioration during hospital stay [4].

Our findings showed that the percentage of symptomatic patients with comorbidity was lower compared to asymptomatic patients. A similar finding was reported by a study in Saudi Arabia which indicated that lower prevalence of comorbidity among symptomatic compared to asymptomatic patients (asthma: 2.7% vs 6.7%, $p = 0.623$; diabetes mellitus: 13.5% vs 37.8%, $p = 0.023$ and hypertension: 27% vs 26.7%, $p = 1.000$) [14]. The protective effect of having comorbidity towards having symptoms in our results should be interpreted with caution. Our knowledge, especially on COVID-19 pathogenesis and risk factors among local population is mainly based on preliminary data. The presence of one asthmatic patient in our study, which could give rise to this finding, needs further investigation, particularly on the use of inhaled corticosteroid. Previous literatures had highlighted an inhaled corticosteroid will help to reduce this inflammation and subsequently enhance anti-viral immunity [15,16]. The association of laboratory investigation i.e., haemoglobin and liver profile with our symptomatic patients' needs to be investigated further as most of them were respiratory-related symptoms. There were insufficient evidence for concrete discussion and to draw conclusion. Furthermore, the recorded symptoms were based on information upon admission only. However, our symptomatic patients shown higher liver function profile, while patients admitted in China, higher total bilirubin [9] and alkaline phosphatase [3,9] were significantly associated with ICU care. It warrants further investigations to test the hypothesize of possible vulnerability to liver injury [3] in our study population. Furthermore, despite the higher liver function profile in our symptomatic patients' values were within the normal range. This study has some limitations. It is a single-centre study with a small sample size. Some relevant epidemiological data such as duration from onset to first positive swab or to admission could not be reported, as our patients were unable to recall the onset date and were also asymptomatic. The significant statistical findings should be interpreted with caution due to the limited sample size and the lack of multivariable adjusted analysis.

## Conclusions

In this single-centre study, COVID-19 infections led not only to case clusters but also to sporadic infections, with patients being either symptomatic or asymptomatic. These sporadic cases and asymptomatic patients may hamper effective contact tracing, leading to rapid human-to-human transmission in our population. Movement restrictions may not be a feasible long-term plan but on the other hand, failing to enforce social distancing would lead to irresprible infection rates. Findings from this study could serve as a basis for future studies especially on the prevalence and clinical significance of asymptomatic and presymptomatic COVID-19 patients. This would pre-emptively address issues on further containment of the pandemic.

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### Authors' Contributions

NA, AMN, MRH, ANA, RH, FD, SAS, PP and NK involved in the conception and design of the study. NA, NFMA and NK involved in the acquisition of data, analysis and interpretation. NA, NK and AHAG involved in drafting the article and revising it critically for important intellectual content. NA and NK involved in final approval of the version to be submitted.

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