Clinical characteristics and outcomes of COVID-19 patients in a tertiary hospital in Baguio City, Philippines

Karen Joyce C. Cortez, Bernard A. Demot, Samantha S. Bartolo, Dexter D. Feliciano, Verna Moira P. Ciriaco, Imari Irish E. Labi, Denzelle Diane M. Viray, Jenna Charisse M. Casuga, Karol Anne B. Camonayan-Flor, Precious Mae A. Gomez, Marie Ellaine N. Velasquez, Theo Pamela T. Cajallo, Jovy E. Nigos, Maria Lowella F. De Leon, Domingo P. Solimen, Angelita G. Go, Francis M. Pizarro, Larry C. Haya Jr, Ray P. Aswat, Virginia B. Mangali, Caesar Noel I. Palaganas, Melvin N. Genuino, Kimberley M. Cotiyog-Ubando, Karen C. Tadeo, Marienelle L. Longid, Nowell Benedict C. Calbagan, Joel B. Bongotan, Beverly Anne T. Dominguez-Villar and Joeffrey B. Dalao

Objective: Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), primarily targets the respiratory system. This study describes the characteristics associated with mortality among patients infected with SARS-CoV-2 at a single hospital in Baguio City, Philippines.

Methods: We reviewed medical records (including history, laboratory results and treatment regimen) of 280 confirmed COVID-19 patients admitted to a single hospital during March–October 2020. Clinical characteristics and outcomes (frequency and type of complication, recovery rate and mortality) were evaluated. Multiple logistic regression was used to analyse factors associated with mortality.

Results: The mean age of COVID-19 patients was 48.4 years and the female-to-male ratio was 1.8:1. Hypertension, cardiovascular disease (CVD) and diabetes were the most frequent comorbidities reported. Common presenting symptoms were respiratory and constitutional, with 41% of patients not reporting symptoms on admission. Patients with moderate, severe and critical disease comprised 45%, 8% and 4%, respectively. A total of 15% had complications, health care-associated pneumonia being the most frequent complication. The recovery rate was 95%; 5% of patients died, with multiorgan failure being the most common cause. The presence of CVD, chronic kidney disease, prolonged prothrombin time and elevated lactate dehydrogenase (LDH) were associated with mortality.

Discussion: Most COVID-19 patients in our population had asymptomatic to moderate disease on admission. Mortality from COVID-19 was associated with having CVD, chronic kidney disease, elevated LDH and prolonged prothrombin time. Based on these results, we emphasize that people should take all necessary precautions to avoid infection with SARS-CoV-2.

Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), primarily targets the respiratory system. In December 2019, an epidemiological alert was released in China following a rise in cases of pneumonia of unknown cause. The Philippines announced its first confirmed case on 31 January 2020.1,2 The World Health Organization (WHO) officially declared a global pandemic on 11 March 2020, by which time the Philippines already had 49 confirmed cases, largely in the National Capital Region.2

Baguio City is located north of Manila, within the Cordillera Central mountain range in northern Luzon. The estimated population is 345 000, with adults (aged 19–60 years) and those aged over 60 years comprising 52% and 6.6% of the population, respectively.3 Leading causes of morbidity include hypertension, diabetes, bronchitis and asthma.4

The first confirmed case in Baguio City was recorded on the city’s ninth day of quarantine during March 2020, with local sustained transmission declared six months later.5 Worldwide, by the end of October 2020, there were 43 623 111 confirmed cases and 1 161 311 deaths. At that time in the Philippines, cases had risen...
Patients were labelled “asymptomatic” if they had no symptoms; “mild” if they had constitutional and non-specific symptoms; “moderate” if they had pneumonia but did not require oxygen; “severe” if they had pneumonia plus hypoxemia, tachypnoea or hypotension; and “critical” if they had worsening pneumonia, sepsis or septic shock.

In our analysis, we explored clinical characteristics and outcomes (frequency and type of complication, recovery rate and mortality) and identified factors associated with mortality in COVID-19 patients. Median, means, standard deviations and proportions were used to summarize the data. The t-test and chi-squared test were used to test for differences in means and proportions, respectively. The Mann-Whitney U test was used to compare differences in median values. Fisher’s exact test or the chi-squared test was used to examine differences between categorical data. A stepwise analysis model using multiple logistic regression was used to determine which variables were associated with mortality. Variables that were statistically significant ($P < 0.05$) in the univariate analysis were selected. Although both disease severity and qSOFA were statistically significant at the univariate level, only the former was included in the final model because these two variables had overlapping definitions. EPI-Info version 7.2.4.0 was used to process the data.

**RESULTS**

**Characteristic of cases at hospital admission**

The mean age of the 280 COVID-19 patients was 48.4 years and the majority (64%) were females. Two thirds (63%) were aged under 60 years. More than half (62%) had exposure to a known case through either travel or close contact. The majority (58%, 161/280) of cases had at least one comorbidity, and 34% (94/280) had two or more comorbidities, with hypertension, cardiovascular disease (CVD) and diabetes being the most frequent. Pregnant patients comprised 16% of the cases and health care workers 23% (Table 1A). Among pregnant patients, 71% were in their third trimester of pregnancy.

Upon admission, 59% of patients complained of symptoms, most commonly respiratory (cough, cold or dyspnoea) and constitutional (fever or malaise) in nature. The other 41% did not report symptoms on admission. Twenty-one per cent of patients were observed to have
Clinical characteristics and outcomes of COVID-19 patients in a tertiary hospital in Baguio City, Philippines

Cortez et al

| Clinical characteristics | Total, n (%) | Recovered, n (%) | Died, n (%) | P |
|--------------------------|--------------|------------------|-------------|---|
| Total number of patients | 280          | 267              | 13          |   |
| Age, years               |              |                  |             |   |
| Mean ± SD                | 48.4 ± 18.5  | 47.7 ± 18.5      | 62.2 ± 13.5 | 0.71 |
| 18–44                    | 131 (46.8)   | 129 (48.3)       | 2 (15.3)    | 0.01 |
| 45–59                    | 44 (15.7)    | 43 (16.1)        | 1 (7.7)     |   |
| 60–79                    | 98 (35.0)    | 88 (33.0)        | 10 (76.9)   |   |
| ≥80                      | 7 (2.5)      | 7 (2.6)          | -           |   |
| Sex                      |              |                  |             |   |
| Female                   | 179 (64.0)   | 174 (65.2)       | 5 (38.5)    | 0.05 |
| Male                     | 101 (36.1)   | 93 (34.8)        | 8 (61.5)    |   |
| Comorbidities            |              |                  |             |   |
| Hypertension             | 124 (44.3)   | 114 (42.7)       | 10 (76.9)   | 0.02 |
| Diabetes mellitus        | 47 (17.0)    | 45 (16.9)        | 2 (15.4)    | 0.62 |
| Cardiovascular disease   | 34 (12.1)    | 26 (9.7)         | 8 (61.5)    | <0.01 |
| Bronchial asthma         | 17 (6.1)     | 16 (6.0)         | 1 (7.7)     | 0.57 |
| Malignancy               | 12 (4.3)     | 12 (4.5)         | -           |   |
| Chronic kidney disease   | 4 (1.4)      | 1 (0.4)          | 3 (23.1)    | <0.01 |
| Chronic obstructive pulmonary disease | 3 (1.1) | 3 (1.1) | - |   |
| Number of comorbidities  |              |                  |             |   |
| 0                        | 119 (42.5)   | 119 (44.6)       | -           | <0.01 |
| 1                        | 68 (24.3)    | 65 (24.3)        | 3 (23.1)    |   |
| 2                        | 66 (23.6)    | 59 (22.1)        | 7 (53.9)    |   |
| >2                       | 27 (9.6)     | 24 (9.0)         | 3 (23.1)    |   |
| Patient reported symptoms|              |                  |             |   |
| Cough                    | 111 (39.6)   | 101 (37.8)       | 10 (76.9)   | <0.01 |
| Cold                     | 49 (17.5)    | 48 (18.0)        | 1 (7.7)     | 0.30 |
| Fever                    | 40 (14.3)    | 35 (13.1)        | 5 (38.5)    | 0.03 |
| Malaise                  | 37 (13.2)    | 31 (11.6)        | 6 (46.2)    | <0.01 |
| Dyspnoea                 | 35 (12.5)    | 28 (10.5)        | 7 (53.9)    | 0.27 |
| Sore throat              | 26 (9.3)     | 26 (9.7)         | -           |   |
| Headache                 | 24 (8.6)     | 24 (9.0)         | -           |   |
| Anosmia                  | 17 (6.1)     | 17 (6.4)         | -           |   |
| Dysgeusia                | 14 (5.0)     | 14 (5.2)         | -           |   |
| Anorexia                 | 12 (4.3)     | 10 (3.8)         | 2 (15.4)    | 0.10 |
| Diarrhoea                | 11 (3.9)     | 11 (4.1)         | -           |   |
| Chills                   | 4 (1.4)      | 2 (0.8)          | 2 (15.4)    | 0.01 |
| Seizure                  | 2 (0.7)      | 2 (0.8)          | -           |   |
| Disease severity at admission based on national COVID-19 case definitions|              |                  |             |   |
| Asymptomatic             | 43 (15.4)    | 43 (16.1)        | -           |   |
| Mild                     | 77 (27.5)    | 76 (28.5)        | 1 (7.1)     | <0.01 |
| Moderate                 | 126 (45.0)   | 123 (46.1)       | 3 (23.1)    |   |
| Severe                   | 23 (8.2)     | 21 (7.9)         | 2 (15.4)    |   |
| Critical                 | 11 (3.9)     | 4 (1.5)          | 7 (53.8)    |   |
Cortez et al

Clinical characteristics and outcomes of COVID-19 patients in a tertiary hospital in Baguio City, Philippines

The mean time from illness onset to discharge from hospital for recovered patients was 15.5 days (range: 4.0–54.0) with the mean hospital stay being 11.7 (±5.6) days (range: 3.0–49.0). For cases who died, the mean time from illness to death was 11.5 days (range: 4.0–29.0) (Fig. 2).

Forty-two (15%) cases had complications, most of whom had moderate to critical disease on admission (32/42) (Table 1).

Most patients (93.6%) had procalcitonin < 0.5 ng/mL. Many had high-sensitivity C-reactive protein > 10 ng/mL (37%) and ferritin > 341 ng/mL (42%). A few had elevations in other inflammatory markers such as LDH, aspartate aminotransferase, alanine transaminase and D-dimer, whereas anaemia, leukopenia and thrombocytopenia were not typical (Table 1A).

More than half of the population had chest radiography findings, with infiltrates being the most common. Computed tomography was available to two thirds (62%) of patients. Findings were noted in 71%, ground glass opacity being the most common (Table 1B).

Illness outcomes

The overall recovery rate was 95% (267/280), with most recovered cases having asymptomatic to moderate disease on admission. All health care workers and pregnant patients recovered. Mortality occurred in 5% (13/280) of patients, with the most common cause of death being multiorgan failure (39%, 5/13). Among those who died, most were males in the 60–79-year age group with at least one comorbidity, respiratory symptoms on admission, a qSOFA score ≥1 and bilateral lung involvement. Nine were assessed as having severe to critical disease at admission (Fig. 1).

The mean time from illness onset to discharge from hospital for recovered patients was 15.5 days (range: 4.0–54.0) with the mean hospital stay being 11.7 (±5.6) days (range: 3.0–49.0). For cases who died, the mean time from illness to death was 11.5 days (range: 4.0–29.0) (Fig. 2).

Forty-two (15%) cases had complications, most of whom had moderate to critical disease on admission (32/42) (Table 1, Fig. 2). Health care-associated pneumonia was the most frequent complication. Among the 14 patients who developed acute kidney injury, six underwent haemodialysis and none of those six survived. Among patients with complications, 30 (71%) recovered and 12 (29%) died. Among those who died, many had cardiovascular or renal complications or secondary infections (Table 2).

Treatment of cases

Antibiotics were prescribed for 73% of cases and antiviral drugs for 55% of cases (Table 3). The most common antiviral drugs used were oseltamivir (83/154), favipiravir (54/154), remdesivir (16/154) and lopinavir-ritonavir (1/154). Hydroxychloroquine was administered during March–May 2020, while steroids, particularly dexamethasone, were prescribed to patients from August 2020. Supplemental oxygen was used in 11% of cases (Table 3). Among the seven cases who underwent renal replacement therapy, only one had underlying chronic kidney disease. Patients with extrapulmonary syndrome such as stroke, myocardial infarction and seizure were treated according to guidelines for the general population.

Mortality from COVID-19

Using multiple logistic regression with a stepwise analysis model, factors associated with mortality in patients with COVID-19 were chronic kidney disease, CVD, prothrombin time > 15.3 seconds and LDH > 400 (Table 4).

| Clinical characteristics | Total, n (%) | Recovered, n (%) | Died, n (%) | P |
|--------------------------|--------------|-----------------|-------------|---|
| Quick sequential organ failure assessment (qSOFA) score | | | | |
| 0 | 228 (81.4) | 225 (84.3) | 3 (23.1) | <0.01 |
| 1 | 46 (16.4) | 39 (14.6) | 7 (53.9) | |
| 2 | 5 (1.8) | 3 (1.1) | 2 (15.4) | |
| 3 | 1 (0.4) | 0 (0.0) | 1 (7.7) | |
| Glasgow coma score < 15 | 4 (1.4) | 1 (0.4) | 3 (23.1) | <0.01 |
| Respiratory rate ≥22 breaths/min | 32 (11.4) | 24 (9.0) | 8 (61.5) | <0.01 |
| Systolic blood pressure ≤100 mmHg | 23 (8.2) | 20 (7.5) | 3 (23.1) | 0.08 |

P values < 0.05 are italicized.
Clinical characteristics and outcomes of COVID-19 patients in a tertiary hospital in Baguio City, Philippines

Cortez et al

Table 1B. Pertinent baseline diagnostic test results of adult COVID-19 patients admitted to Baguio General Hospital and Medical Center from 1 March to 27 October 2020

| Diagnostic test | Reference range | Total \(n\) (range/%) | Recovered \(n\) (range/%) | Died \(n\) (range/%) | \(P\) |
|-----------------|-----------------|----------------------|-------------------------|------------------|------|
| Serum           |                 |                      |                         |                  |      |
| Haemoglobin (g/L) \((n = 280)\) | 120–160         | 141 (131–152)        | 141 (131–152)          | 140 (124–142)    | 0.56 |
| <120            | 21 (7.5)        | 20 (7.5)             | 1 (7.7)                |                  | 0.65 |
| Haematocrit (L/L) \((n = 280)\) | 0.37–0.47       | 0.4 (0.4–0.5)        | 0.4 (0.4–0.5)          | 0.4 (0.38–0.41)  | 0.37 |
| ≥0.47           | 46 (16.4)       | 45 (16.9)            | 1 (7.7)                |                  | 0.34 |
| Leukocytes \(10^9/L\) \((n = 280)\) | 5–10            | 7.5 (5.8–9.8)        | 7.5 (5.8–9.7)          | 8.0 (6.3–10.9)   | 0.47 |
| <4              | 14 (5.0)        | 14 (5.2)             | –                      |                  |      |
| Neutrophil–lymphocyte ratio | 1–3             | 2.5 (1.6–22.8)       | 2.4 (1.6–3.5)          | 4.4 (3.2–6.6)    | <0.01|
| ≤3              | 185 (66.1)      | 182 (68.2)           | 3 (23.1)               |                  | <0.01|
| >3 to <9        | 83 (29.6)       | 76 (28.5)            | 7 (53.9)               |                  | 0.05 |
| ≥9              | 12 (4.3)        | 9 (3.4)              | 3 (23.1)               |                  | 0.01 |
| Platelets \((n = 279)\) | 150–400         | 253.0 (198–313)      | 257.0 (202–316)        | 196.0 (158.5–211.5) | <0.01|
| <125            | 5 (1.8)         | 4 (1.5)              | 1 (8.3)                |                  | 0.20 |
| High-sensitivity C-reactive protein (mg/L) \((n = 264)\) | <5              | 5.0 (1.5–18.7)       | 4.7 (1.5–16.0)         | 83.6 (33.4–131.5) | <0.01|
| 5–10            | 33 (12.5)       | 33 (13.1)            | –                      |                  |      |
| >10             | 98 (37.1)       | 87 (34.5)            | 11 (91.7)              |                  | <0.01|
| Procalcitonin (ng/mL) \((n = 236)\) | 0.05 (0.02–0.12) | 0.05 (0.02–0.11) | 1.17 (0.13–1.81) | <0.01 |
| <0.5            | 221 (93.6)      | 217 (96.4)           | 4 (36.4)               |                  | <0.01|
| Lactate dehydrogenase (U/L) \((n = 263)\) | <247            | 216.3 (174.6–285.8)  | 214.9 (174.3–278.9)    | 407.6 (236.5–657.3) | <0.01|
| >400            | 19 (7.2)        | 12 (4.8)             | 7 (53.9)               |                  |      |
| Creatinine (mg/dL) \((n = 278)\) | 0.55–1.02       | 0.71 (0.60–0.86)     | 0.71 (0.60–0.85)       | 0.76 (0.71–2.6)  | 0.04 |
| >1.02           | 36 (13.0)       | 30 (11.3)            | 6 (46.2)               |                  |      |
| Aspartate aminotransferase (UL) \((n = 277)\) | <35             | 29.3 (23.2–40.0)     | 28.8 (22.9–39.0)       | 52.1 (33.7–86.0) | <0.01|
| >95             | 12 (4.3)        | 9 (3.4)              | 3 (23.1)               |                  | 0.01 |
| Alanine transaminase (UL) \((n = 278)\) | <35             | 29.6 (17.8–46.0)     | 28.8 (17.4–44.1)       | 42.9 (25.0–49.4) | 0.09 |
| >95             | 17 (6.1)        | 15 (5.7)             | 2 (15.4)               |                  |      |
| Ferritin (ng/mL) \((n = 190)\) | 4–341           | 295.0 (68.1–653.7)   | 281.1 (63.5–604.8)     | 982.1 (238.7–1611.0) | 0.04|
| >341            | 80 (42.1)       | 75 (41.0)            | 5 (71.4)               |                  | 0.11 |
| Prothrombin time (seconds) \((n = 266)\) | 12.1 (11.5–12.8) | 12.1 (11.4–12.7) | 12.8 (12.3–18.7) | <0.01 |
| >15.3           | 7 (2.6)         | 2 (0.8)              | 5 (38.5)               |                  | <0.01|
| Partial thromboplastin time (seconds) \((n = 263)\) | 29.6 (27.7–31.8) | 29.5 (27.7–31.8) | 33.2 (27.1–39.7) | 0.12 |
| >35             | 24 (9.1)        | 20 (8.0)             | 4 (33.3)               |                  | 0.02 |
| D-dimer (µg/mL) \((n = 260)\) | <0.5            | 0.54 (0.18–1.19)     | 0.52 (0.34–1.17)       | 0.94 (0.63–5.36) | 0.03 |
| >1              | 61 (29.6)       | 57 (28.8)            | 4 (50.0)               |                  | 0.18 |
Clinical characteristics and outcomes of COVID-19 patients in a tertiary hospital in Baguio City, Philippines

Cortez et al

| Diagnostic test                  | Reference range | Total n (range/%) | Recovered n (range/%) | Died n (range/%) | P   |
|----------------------------------|-----------------|-------------------|-----------------------|------------------|-----|
| Imaging                          |                 |                   |                       |                  |     |
| Chest radiograph                 | N = 276         | N = 263           | N = 13                |                  |     |
| Patients with findings           | 151 (54.7)      | 140 (53.2)        | 11 (84.6)             | 0.04             |     |
| Infiltrates                      | 147 (97.4)      | 139 (99.3)        | 8 (72.7)              | <0.01            |     |
| Effusion                         | 2 (1.3)         | 1 (0.7)           | 1 (9.1)               | 0.11             |     |
| Consolidation                    | 3 (2.0)         | 1 (0.7)           | 2 (18.2)              | 0.01             |     |
| Computed tomography              | N = 174         | N = 166           | N = 8                 |                  |     |
| Patients with findings           | 124 (71.3)      | 118 (71.1)        | 6 (75.0)              | 1.00             |     |
| Ground glass opacity             | 111 (89.5)      | 105 (89.0)        | 6 (100)               | 1.00             |     |

*P* values <0.05 are italicized.

SD: standard deviation.

**Table 2.** Frequency of complications in adult COVID-19 patients admitted to Baguio General Hospital and Medical Center from 1 March to 27 October 2020

| Complications                      | Total n (%) | Recovered n (%) | Died n (%) | P   |
|------------------------------------|-------------|-----------------|------------|-----|
| Total number of patients           | 280         | 267             | 13         |     |
| Number of patients with complications | 42 (15.0)  | 30 (11.2)       | 12 (92.3)  | <0.01|
| Secondary infection                | 22 (7.9)    | 16 (6.0)        | 6 (46.2)   | <0.01|
| HCAP                               | 17 (6.1)    | 13 (4.9)        | 4 (30.8)   | <0.01|
| Septic shock                       | 6 (2.1)     | 2 (0.8)         | 4 (30.8)   | <0.01|
| Bacteraemia                        | 3 (1.1)     | 3 (1.1)         | -          |     |
| CAUTI                              | 1 (0.4)     | -               | 1 (7.7)    |     |
| Acute kidney injury                | 14 (5.0)    | 5 (1.9)         | 9 (69.2)   | <0.01|
| Cardiovascular                     | 11 (3.9)    | 2 (0.8)         | 9 (69.2)   | <0.01|
| Myocardial infarction              | 7 (2.5)     | 1 (0.4)         | 6 (46.2)   | <0.01|
| Fatal arrhythmia                   | 7 (2.5)     | 1 (0.4)         | 6 (45.2)   | <0.01|
| Transaminitis                      | 11 (3.9)    | 10 (3.8)        | 1 (7.7)    | 0.41|
| Haematologic/immunologic           | 8 (2.9)     | 4 (1.5)         | 4 (30.8)   | <0.01|
| Cytokine storm                     | 4 (1.4)     | 2 (0.8)         | 2 (15.4)   | 0.01|
| Thrombocytopenia                   | 3 (1.1)     | 1 (0.4)         | 2 (15.4)   | 0.01|
| Leukopenia                         | 1 (0.4)     | 1 (0.4)         | -          |     |
| Neurological                       | 2 (0.7)     | -               | 2 (15.4)   |     |
| Seizure                            | 1 (0.4)     | -               | 1 (7.7)    |     |
| Stroke (ischaemic)                 | 2 (0.7)     | -               | 2 (15.4)   |     |

*P* values <0.05 are italicized.

CAUTI: catheter-associated urinary tract infection; HCAP: health care-associated pneumonia.
Clinical characteristics and outcomes of COVID-19 patients in a tertiary hospital in Baguio City, Philippines

Table 3. Treatment modalities of adult COVID-19 patients admitted to Baguio General Hospital and Medical Center from 1 March to 27 October 2020

| Treatment                              | Total n (%) | Recovered n (%) | Died n (%) | P       |
|----------------------------------------|-------------|-----------------|------------|---------|
| Total number of patients               | 280         | 267             | 13         |         |
| Antibiotics                            | 203 (72.5)  | 192 (71.9)      | 11 (84.6)  | 0.26    |
| Antivirals                             | 154 (55.0)  | 149 (55.8)      | 5 (38.5)   | 0.17    |
| Immunomodulators                       | 70 (25.0)   | 61 (22.9)       | 9 (69.2)   | <0.01   |
| Hydroxychloroquine                     | 25 (8.9)    | 24 (9.0)        | 1 (7.7)    | 0.67    |
| Corticosteroids                        | 45 (16.1)   | 37 (13.9)       | 8 (61.5)   | <0.01   |
| Intravenous immunoglobulin             | 4 (1.4)     | 3 (1.1)         | 1 (7.7)    | 0.17    |
| Tocilizumab                            | 3 (1.1)     | 2 (0.8)         | 1 (7.7)    | 0.13    |
| Oxygen support                         | 32 (11.4)   | 24 (9.0)        | 8 (2.9)    | <0.01   |
| Nasal cannula                          | 24 (8.6)    | 21 (7.9)        | 3 (23.1)   | 0.09    |
| Face mask                              | 3 (1.1)     | 1 (0.4)         | 2 (15.4)   | 0.01    |
| Invasive mechanical ventilation        | 5 (1.8)     | 2 (0.8)         | 3 (23.1)   | <0.01   |
| Renal replacement therapy              | 7 (2.5)     | 1 (0.4)         | 6 (46.2)   | <0.01   |
| Haemodialysis                          | 5 (1.8)     | 1 (0.4)         | 4 (30.8)   | <0.01   |
| Haemodialysis with haemoperfusion      | 2 (0.7)     | -               | 2 (15.4)   |         |

P values <0.05 are italicized.

Fig. 1. Outcomes of adult patients with COVID-19 based on disease severity on admission to Baguio General Hospital and Medical Center (n = 280)
Clinical characteristics and outcomes of COVID-19 patients in a tertiary hospital in Baguio City, Philippines

Cortez et al

DISCUSSION

Our study assessed the clinical profile and outcomes of hospitalized adult COVID-19 patients in a single hospital in Baguio City, Philippines. The COVID-19 cases comprised mostly female patients with a mean age of 48.4 years. Moderate, severe and critical disease made up 45%, 8% and 4% of the COVID-19 patients, respectively. The recovery rate was 95% and mortality was associated with having chronic kidney disease, CVD, elevated LDH and prolonged prothrombin time at hospital admission.

The female-to-male ratio in our study was 1.8:1, yet 62% of cases that died were male. Several other studies have shown a male predominance of COVID-19 cases, and a recent meta-analysis showed that male sex was significantly associated with severe disease. However, in our study, there was no significant difference

Table 4. Factors associated with mortality of adult COVID-19 patients admitted to Baguio General Hospital and Medical Center from 1 March to 27 October 2020

| Variables                             | Adjusted odds ratios | 95% confidence interval | P value |
|---------------------------------------|----------------------|--------------------------|---------|
| Presence of chronic kidney disease    | 324.7                | 12.5 to 8456.4           | 0.001   |
| Presence of cardiovascular disease    | 10.6                 | 1.7 to 66.8              | 0.012   |
| Prothrombin time ≥15.3 sec            | 74.6                 | 3.6 to 1562.6            | 0.006   |
| Lactate dehydrogenase >400            | 26.4                 | 3.8 to 184.6             | 0.001   |

P values <0.05 are italicized.

Fig. 2. Mean duration (in days) of illness to admission, hospital duration, and onset of complications among patients admitted to Baguio General Hospital and Medical Center from 1 March to 27 October 2020

AKI: acute kidney injury; HCAP: health care-associated pneumonia.
in sex between the cases that recovered and those that died. The high female-to-male ratio in our study may have been due to the former outnumbering the latter in all age groups except for those aged 1–4 years in Baguio City.4

In our study, 77% of COVID-19 cases that died were aged 60–79 years, reflecting national data, whereby 60% of confirmed deaths were males aged at least 60 years.15 Old age is a known risk factor for severe COVID-19, for reasons not yet fully understood.16,17 Changes in the immune system and prevalence of comorbidities in this age group contribute to the risk.

WHO recognizes that underlying comorbidities can negatively impact outcomes in COVID-19 patients,18 with confirmed COVID-19 patients with comorbidities having increased admission rates to intensive care units and mortality.19 Although all the cases in our study who died had at least one comorbidity, the presence of a comorbidity did not in itself significantly increase the likelihood of death. However, having chronic kidney disease and CVD were significantly associated with mortality. Chronic kidney disease is considered the most prevalent risk factor for severe COVID-19 worldwide, especially for patients with an estimated glomerular filtration rate <30 mL/min/1.73 m².17,20 In addition to chronic kidney disease, a higher proportion of those who died also had acute renal complications warranting haemodialysis. It is hypothesized that kidney involvement is through direct cellular and immune-mediated damage due to the presence of the virus.21 COVID-19 patients presenting with acute kidney injury have been shown to have a higher risk of death than patients with acute kidney injury from other conditions.22 A recent meta-analysis found that pre-existing CVD is also an independent risk factor associated with poor outcomes from COVID-19.23 Patients who have pre-existing comorbidities or present with complications should be closely monitored for severe outcomes. This, in combination with evidence relating to other complications during COVID-19 infection (e.g. hospital-acquired infections), supports the rapidly accumulating evidence that COVID-19 may have multisystemic affectations.

Our study found an association between mortality and prolonged prothrombin time (>15.3 seconds) and elevated LDH (>400). Several studies have shown that a prolonged prothrombin time is associated with a poorer outcome among COVID-19 patients.24,25 Coagulation parameters not only reflect haemostasis but are also associated with the inflammation and organ dysfunction brought about by COVID-19 infection. In a pooled analysis, elevated LDH values were associated with a 6-fold increase in odds of severe COVID-19 disease and >16-fold increase in odds of mortality.26 Since LDH is present in lung tissue, patients with severe COVID-19 infections who present with a severe form of interstitial pneumonia can be expected to release greater amounts of LDH in the circulation.

High baseline levels of inflammatory biomarkers (e.g. serum LDH, alanine transaminase and D-dimer) are considered poor prognostic factors that are associated with mortality, increased stay in the intensive care unit and severe disease.11 Certain haematological abnormalities (e.g. decreased haemoglobin, white blood cell count and platelets), although not rare in COVID-19, are seen in severe disease.27 Both scenarios were seen in a minority of our cases. This may relate to our population’s low mortality rate. Meanwhile, a low or normal procalcitonin level, observed in a high number of patients in our study, is compatible with a viral infection. Elevated levels may be due to other non-viral, even non-infectious, causes.11

That 73% of our patients received antibiotics is a concern, although this was mainly as a preventive measure and due to many patients having a secondary infection, including hospital-acquired pneumonia, bacteraemia and complicated urinary tract infections. Secondary infections can contribute to a poorer outcome, and when faced with severely ill hospitalized patients where the diagnosis of a bacterial superinfection is uncertain, antibiotics are often started.28 Because this study was in the early phase of the pandemic, hydroxychloroquine and lopinavir-ritonavir were included among the investigational drugs given to patients.

The most common symptoms in our COVID-19 patients were cough, cold, fever, dyspnoea and malaise. Although, in the univariate analysis, the proportions reporting cough, fever and malaise were significantly higher in cases that died than in those that recovered, these proportions were not associated with mortality in multivariate analysis. Other studies have identified various symptoms as prognosticators for mortality. Dyspnoea was consistently identified as a risk factor for mortality in multinational meta-analyses involving thousands of patients.29,30 In contrast, a meta-analysis involving >50 000 patients in 13 countries showed that headache,
diarrhoea, vomiting and cough indicate a lower risk of death. In addition, anosmia and dysgeusia are peripheral neurological symptoms of COVID-19 that have been investigated for their association with recovery, with studies on anosmia reporting it as being inversely associated with hospitalization and as a marker of milder COVID-19 disease. Conversely, a meta-analysis showed that olfactory and taste dysfunction had no bearing on severity of COVID-19 disease. In our study, all patients presenting with dysgeusia and anosmia recovered. Differences in study definitions, study methodologies and tools for detecting anosmia and dysgeusia may account for the differences in results.

Pregnancy is now recognized as a risk factor for contracting COVID-19. A weakened immune system during pregnancy confers a higher risk of infection with SARS-CoV-2. In this study, 45 patients were pregnant but none died. Possible causes for this low mortality rate could be the lower age of pregnant patients as well as the lower rate of concomitant comorbidity in this subgroup.

Our study had some limitations. First, the study design was cross-sectional; causal inference and associations may be inherently difficult to make and interpret because the outcome, exposure and investigated risk factors were collected simultaneously. The frequency and type of complications seen in our patients cannot be wholly attributed to the effects of COVID-19. Second, the selection of our study population was non-randomized, and data analysis was non-stratified and non-matching. Although multiple logistic regression was used to identify risk factors associated with mortality, our sample size was small, leading to wide confidence intervals. Therefore, caution should be applied when interpreting the results. At the time of writing, the pandemic is ongoing and the clinical profile and prognosis of COVID-19 patients in our institution may change over time.

In conclusion, most of the patients in our population were classified with asymptomatic to moderate disease on admission and few had complications. Overall, 95% of cases recovered and 5% died. The presence of chronic kidney disease, CVD, elevated LDH and prolonged prothrombin time were associated with mortality in our population. Based on these results, we strongly recommend that patients with comorbidities, including pregnancy and those of older age, should take all necessary precautions to avoid getting infected with SARS-CoV-2.

Acknowledgements

The year 2020 was truly a challenge in every community worldwide. We thank the first responders, front-line workers, essential workers, public health leaders, physicians and scientists who are continuing to work tirelessly to treat COVID-19 patients, protect vulnerable populations and prevent the spread of this virus.

We would also like to acknowledge Ms. Carla A. Yee, Ms. Kathleen Hazel C. Sy, the institutional Infection Control Committee and the Hospital Information Management Division.

Conflicts of interest

The authors declare no conflicts of interest.

Ethics approval

This study has been approved by the Ethics Review Board of Baguio General Hospital and Medical Center, Baguio City, Philippines.

Funding statement

This study was self-funded.

References

1. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020;395(10223):497–506. doi:10.1016/S0140–6736(20)30183–5 pmid:31986264. Erratum in: Lancet. 2020 Jan 30. pmid:31986264
2. Updates on novel coronavirus disease (COVID-19). Republic of the Philippines: Department of Health; 2020. Available from: https://www.doh.gov.ph/2019-nCoV?page=1&fbclid=IwAR124CONDFXo6HypQxop1oB0cTJbqVqPz8xH20NId_DvEIG5CPIks3Y, accessed 24 September 2021.
3. Population of the Cordillera Administrative Region (Based on the 2015 Census of Population). Republic of the Philippines: Philippine Statistics Authority; 2020. Available from: https://psa.gov.ph/content/population-cordillera-administrative-region-based-2015-census-population, accessed 24 September 2021.
4. The City Government of Baguio, Baguio City Ecological Profile 2018. Republic of the Philippines; 2020. Available from: https://www.baguio.gov.ph/sites/default/files/city_planning_and_development_office/downloadable_forms/Ecological%20Profile%202018%20%28Chapter%202%29.pdf, accessed 24 September 2021.
5. Catayan ME. 52 COVID-19 clusters in Baguio. SunStar Baguio; 24 August 2020. Available from: https://www.sunstar.com.ph/article/1867996/Baguio/Local-News/52-Covid-19-clusters-in-Baguio, accessed 24 September 2021.
Clinical characteristics and outcomes of COVID-19 patients in a tertiary hospital in Baguio City, Philippines

6. Coronavirus Resource Center. Johns Hopkins University & Medicine; 2020. Available from: https://coronavirus.jhu.edu/, accessed 24 September 2021.

7. WHO Coronavirus (COVID-19) Dashboard. Geneva: World Health Organization; 2020. Available from: https://covid19.who.int/, accessed 24 September 2021.

8. The City Government of Baguio. Republic of the Philippines; 2020. Available from: http://endcovid19.baguio.gov.ph, accessed 24 September 2021.

9. Singer M, Deutschman CS, Seymour CW, Shankar-Hari M, Annane D, Bauer M, et al. The Third International Consensus Definitions for Septis and Septic Shock (Septis-3). JAMA. 2016;315(8):810–10. doi:10.1001/jama.2016.0287 pmid:26903338

10. Simadibrata DM, Calvin J, Wijaya AD, Ibrahim NAA. Neutrophil-to-lymphocyte ratio on admission to predict the severity and mortality of COVID-19 patients: A meta-analysis. Am J Emerg Med. 2021;42:60–9. doi:10.1016/j.ajem.2021.01.006 pmid:33453617

11. Philippine interim guidance on the clinical management of adult patients with suspected or confirmed COVID-19 infection. Philippine College of Physicians; 2020. Available from: https://pcp.org.ph/index.php/interim-guidelines, accessed 24 September 2021.

12. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. Lancet. 2020;395(10229):1054–62. doi:10.1016/S0140-6736(20)30566-8 pmid:32171076

13. Soria MLJ, Macalalad-Josue AA, Quiwa L, Duya J, Calvario MKJ, and the PCP COVID-19 Profile Study Group. Clinical profile and outcomes of hospitalized patients with COVID-19 in the Philippines: a preliminary report [unpublished manuscript]. Philippine College of Physicians (2020).

14. Peckham H, de Gruijter NM, Raine C, Radziszewska A, Ciurtin A, et al. COVID-19 mortality in Lombardy: the vulnerability of the oldest old and the resilience of male centenarians. Aging (Albany NY). 2020;12(15):15186–95. doi:10.18632/aging.103872 pmid:32788424

15. COVID-19 in the Philippines Situation Report 63. Geneva: World Health Organization; 2020. Available from: https://www.who.int/philippines/internal-publications-detail/covid-19-in-the-philippines-situation-report-63, accessed 24 September 2021.

16. Marcon G, Tettamanti M, Capacci G, Fontanel G, Spanò M, et al. COVID-19 mortality in Lombardy: the vulnerability of the oldest old and the resilience of male centenarians. Aging (Albany NY). 2020;12(15):15186–95. doi:10.18632/aging.103872 pmid:32788424

17. Williamson EJ, Walker AJ, Bhaskaran K, Bacon S, Bates C, Morton CE, et al. Factors associated with COVID-19-related death using OpenSAFELY. Nature. 2020;584(7821):430–6. doi:10.1038/s41586-020-2521–4 pmid:32640463

18. Franceschi C, Bonafe M. Centenarians as a model for healthy aging. Biochem Soc Trans. 2003;31(2):457–61. doi:10.1042/bst0310457 pmid:12653662

19. Sanyalou A, Okorie C, Marinkovic A, Patidar R, Younis K, Desai P, et al. Comorbidity and its impact on patients with COVID-19. SN Compr Clin Med. 2020 Jun 25;1–8. doi:10.1007/s42399–020–00363–4 pmid:32838147

20. ERA-EDTA Council; ERACODA Working Group. Chronic kidney disease is a key risk factor for severe COVID-19: a call to action by the ERA-EDTA. Nephrol Dial Transplant. 2021;36(1):87–94. doi:10.1093/ndt/gfaa314 pmid:33540043

21. Adapa S, Chenna A, Balla M, Merugu GP, Koduri NM, Dagguabati SR, et al. COVID-19 pandemic causing acute kidney injury and impact on patients with chronic kidney disease and renal transplantation. J Clin Med Res. 2020;12(6):352–61. doi:10.14740/jcmr4200 pmid:32587651

22. Kolhe NV, Fluck RJ, Selby NM, Taal MW. Acute kidney injury associated with COVID-19: a retrospective cohort study. PLoS Med. 2020;17(10):e1003406. doi:10.1371/journal.pmed.1003406 pmid:33125416

23. Xu J, Xiao W, Liang X, Shi L, Zhang P, Wang Y, et al. A meta-analysis on the risk factors adjusted association between cardiovascular disease and COVID-19 severity. BMC Public Health. 2021;21(1):1533. doi:10.1186/s12889–021–11051-w pmid:34380456

24. Wang L, He WB, Xu YM, Hu DL, Jiang H. Prolonged prothrombin time at admission predicts poor clinical outcome in COVID-19 patients. World J Clin Cases. 2020;8(19):4370–9. doi:10.12998/wjcc.v8.i19.4370 pmid:33083396

25. Long H, Nie L, Xiang L, Li H, Zhang X, Fu X, et al. D-Dimer and prothrombin time are the significant indicators of severe COVID-19 and poor prognosis. BioMed Res Int. 2020;2020:6159720. doi:10.1155/2020/6159720 pmid:32956339

26. Henry BM, Aggarwal V, Wang J, Benoit S, Vikes J, Plebani M, et al. Lactate dehydrogenase levels predict coronavirus disease 2019 (COVID-19) severity and mortality: a pooled analysis. Am J Emerg Med. 2020;38(9):1722–6. doi:10.1016/j.ajem.2020.05.073 pmid:32738466

27. Liu X, Zhang R, He G. Hematological findings in coronavirus disease 2019: indications of progression of disease. Ann Hematol. 2020;99(7):1421–8. doi:10.1007/s00277–020–04103–5 pmid:32495027

28. Ginsburg AS, Klugman KP. COVID-19 pneumonia and the appropriate use of antibiotics. Lancet Glob Health. 2020;8(12):e1453–4. doi:10.1016/s2214–109x(20)30444–7 pmid:33188730

29. Mesas AE, Cavero-Redondo I, Álvarez-Bueno C, Sarriá Cabrera MA, Maffei de Andrade S, Sequí-Dominguez I, et al. Predictors of inhospital COVID-19 mortality: a comprehensive systematic review and meta-analysis exploring differences by age, sex and health conditions. PLoS One. 2020;15(11):e0241742. doi:10.1371/journal.pone.0241742 pmid:33141836

30. Mudatsir M, Fajar JK, Wulandari L, Soegiarto G, Ilmawan M, Purnamasari Y, et al. Predictors of COVID-19 severity: a systematic review and meta-analysis. F1000Res. 2020;9:11107. doi:10.12688/f1000research.26186.1 pmid:3363160

31. Talavera B, García-Azorín D, Martínez-Plas E, Trigo J, Hernández-Pérez I, Valle-Peñacoba G, et al. Anosmia is associated with lower in-hospital mortality in COVID-19. J Neurol Sci. 2020;419:f1000research.26186.1 pmid:33125416

32. Yan CH, Faraji F, Prapaijati DP, Ostrandrer BT, Deconde AS. Self-reported offactory loss associates with outpatient clinical course in COVID-19. Int Forum Allergy Rhinol. 2020;10(7):821–31. doi:10.1002/air.22952 pmid:32329222

33. Zahra SA, Iddawela S, Pillai K, Choudhury RY, Hanky A. Can symptoms of anosmia and dysgeusia be diagnostic for COVID-19? Brain Behav. 2020;10(11):e01839. doi:10.1002/brb3.1839 pmid:32935915

34. Phoswa WN, Khaliq OP. Is pregnancy a risk factor of COVID-19? Eur J Obstet Gynecol Reprod Biol. 2020;252:605–9. doi:10.1016/j.ejogrb.2020.06.058 pmid:32620513